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TECHNICAL MANUAL FOR INTERVIEW® COMSTATE™ II

ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DIVISION
7401 Boston Boulevard, Springfield, Virginia 22153

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NOTICE

Issue 3 of this Technical Manual covers all enhancements to the COMSTATE II through Software Version 12.00. These include X.25 Modulo 128 capabilities, extended frame addressing for bit-oriented protocols, trigger-controlled reset of frame and packet sequence counts, new automatic frame selections for SDLC, three additional transmit variables, storage and reanalysis of CRT data, increased remote transfer capabilities, terminal mode, and a detailed SNA trace (Option 07).

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The menu configurations shown in this manual are intended only to demonstrate various techniques for programming the INTERVIEW COMSTATE II. They are not necessarily appropriate for your real-world data environment.

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COMBTATE II

1
USING THIS MANUAL

This is a reference manual, organized functionally rather than by menu sequence. From the Table of Contents you can see how this allows you to read about each major subject category in depth.

Many of the illustrations are video prints from the CRT input signal. We have used negative images because they give much better definition on the printed page.

Sections 3 through 7 are intended to help you familiarize yourself with your COMSTATE II and get it ready to begin operation. You may not want to read Sections 4 through 6 thoroughly at first, but will refer to them later when using the COMSTATE II has brought out specific questions.

Selection of the appropriate system parameters is explained in Sections 12 though 16.

Section 18 covers the CRT Control menu. The various CRT displays and their keyboard control are described in Sections 8 through 11.

The heart of COMSTATE programming technique is understanding how to use test states to emulate data communications states. This concept is explained in Section 19, and you should make yourself familiar with this before you proceed further. You will find that this technique makes programming amazingly simple and quick.

Programming is made more convenient through the use of program constants and the PROTOCOL SPREADSHEET ™ display. Constants are described in Section 26; the PROTOCOL SPREADSHEET display is explained in Sections 27 through 31.

Read Sections 20 through 25 to understand triggers; then try some monitor programs before you set up an interactive test. Then, consult Sections 39 through 43, which explain how to use the COMSTATE II to test a DCE or DTE. For high-speed operation, that is, data speeds over 19.2 kbps, be sure to read Section 44.

To use the tape or high-speed memory (RAM) to record or play back data see Sections 32 through 35. Tapes can also be used for recording COMSTATE programs (Section 36). Printing data and programs to an ASCII printer is explained in Section 38, and instructions for remote transfer of data and tests are in Section 50.

If your system uses bit-oriented protocols, you should become familiar with Sections 45 through 49, which explain the COMSTATE II's special mnemonic programming selections and automatic protocol analysis for HDLC-type protocols.

Section 51 explains how to use the COMSTATE II as an asynchronous terminal. As such, the COMSTATE II may be used to program and run a remote COMSTATE I, 30B, or 40B.

2
GENERAL DESCRIPTION

The INTERVIEW COMSTATE II can emulate either a DTE or a DCE with regard to both protocol and RS-232 interface control. It can monitor data or test a DTE or DCE at data speeds up to 64 kbps.

The COMSTATE II's unique programming technique has both extraordinary power and simplicity because it can be implemented in direct analogy to data communications states. The analogy lies in the fact that data communications protocols can be defined in terms of inputs and resulting actions without reference to the sequence in which the events will occur. The COMSTATE II uses a very high-level language that eliminates problems of syntax and event sequence. Each of the COMSTATE II's 128 triggers is a single high-level programming statement: when the specified conditions are true, take the specified actions. Using these simple yet very powerful statements you can configure any number of tests, brief or extensive. You can expand a program or break it into modules simply by changing the interrelationships of these trigger statements without any reprogramming.

The COMSTATE II can run two programs simultaneously, and sequences of tests can be loaded automatically from tape and run.

Figure 2-1 is a simplified functional diagram of the COMSTATE II. Notice that there are separate data receivers for the Capture Memory (tape and high-speed RAM) and the trigger programming logic. Tests and analysis programs can be run at the same time the instrument is recording data on tape or in RAM. Recording may be all-inclusive or selective, and controlled either manually or automatically. The recorded data may then be played back for examination, including statistical analysis.

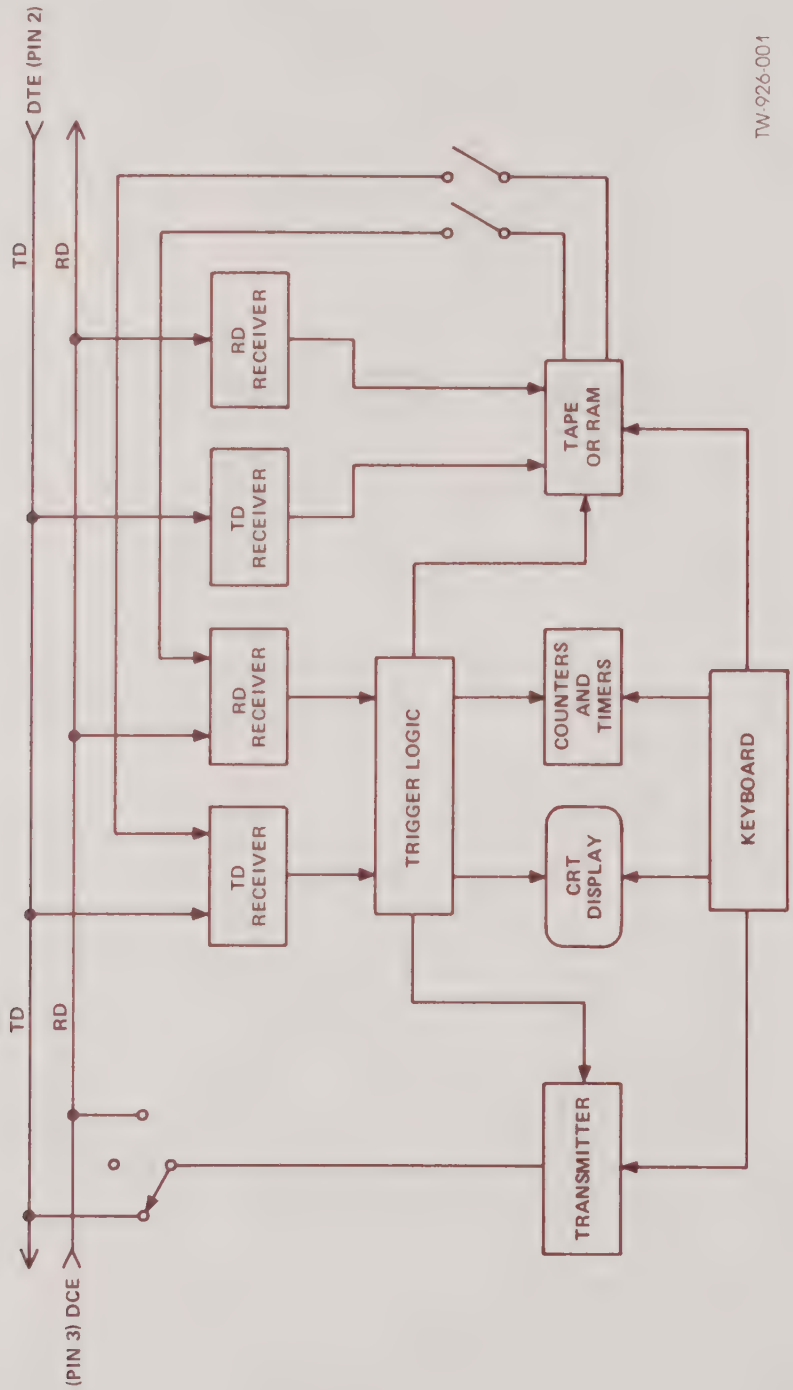

DTE (PIN 2)
TD
RD
RD RECEIVER
TD RECEIVER
RD RECEIVER
TD RECEIVER
TRIGGER LOGIC
TAPE OR RAM
COUNTERS AND TIMERS
CRT DISPLAY
KEYBOARD
TRANSMITTER
TD
RD
(PIN 3) DCE
TW-926-001

Figure 2-1

Programs and data can be printed to asynchronous ASCII printers or transmitted via modems to remote INTERVIEWs. Statistical test results or records of selected data communications occurrences can be logged to a printer with date-time stamping.

Real-time trace displays of state changes and prompts allow you to follow data communications events or the course of your program without having to analyze a data display.

For X.25 or SDLC systems the COMSTATE II will do automatic protocol analyses, including real-time protocol trace displays. In program mode, there is a complete set of mnemonic selections to avoid time-consuming bit-by-bit protocol byte entries.

3
BEFORE POWER-UP

3.1 UNPACKING THE COMSTATE II

As each item is unpacked from the carton, inspect it for obvious mechanical damage. Check the pockets in the packing caps for cables, manuals, and so forth. Retain the original packing material for future reshipment, as it has been designed for maximum protection.

Check the received items against the shipping list.

CAUTION: Do not connect the COMSTATE II to power until you have checked the line voltage selector in accordance with Section 3.2.

3.2 LINE VOLTAGE SELECTOR

The voltage selector is part of the power connector assembly on the right side of the rear panel of the instrument (see Figures 3-1 and 3-2). Slide the transparent window to the left. The line voltage selector card can be seen at the bottom of the window with the present voltage selection visible -- and right side up.

The INTERVIEW COMSTATE II is designed to operate at 95 to 130 V ac, 50 or 60 Hz when 115 V is selected; or from 190 to 260 V ac, 50 or 60 Hz when 230 V is selected.

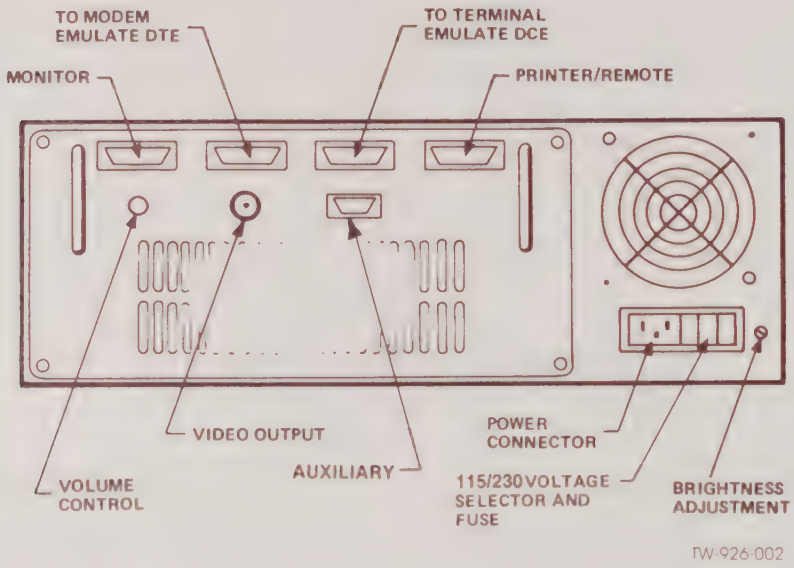


Figure 3-1 Rear panel of INTERVIEW COMSTATE II

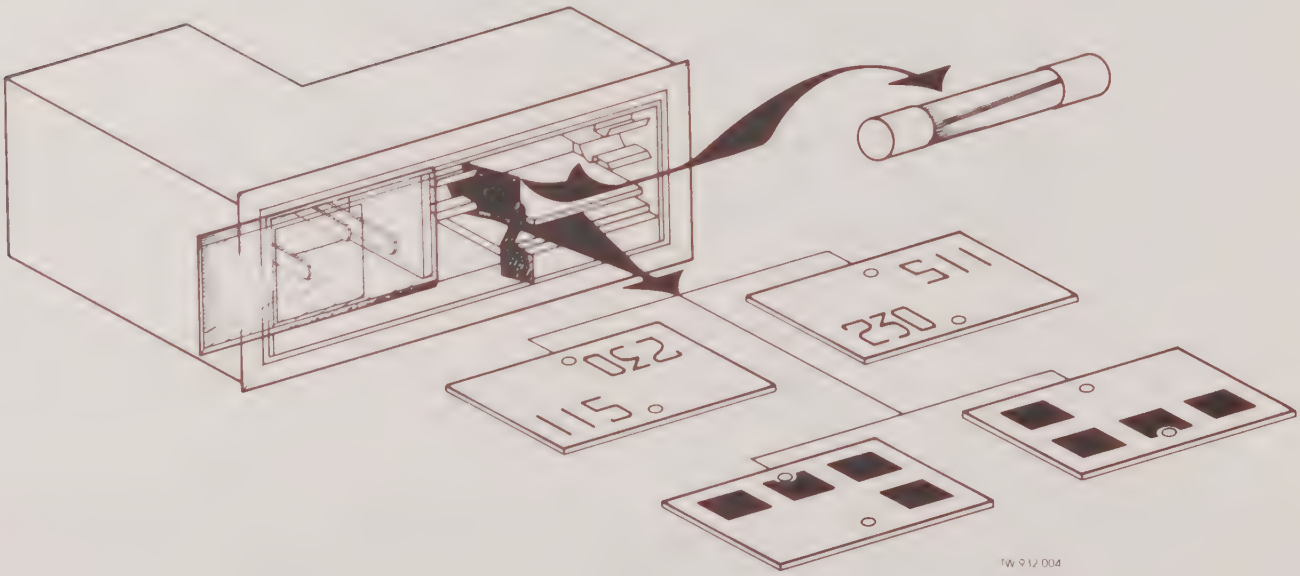


Figure 3-2 Voltage selector

NOTE: The frequency must be selected separately (see Section 3.3).

To change the line voltage selection, swing the fuse extractor handle labeled FUSE PULL out toward the left and remove the fuse. The voltage selector card can then be removed and rotated so that the correct line voltage can be read in the window. When the voltage selector card has been seated correctly, push the fuse extractor handle in and replace the fuse.

3.3 POWER FREQUENCY SELECTION

An internal switch gives a choice between 50- and 60-Hz operation. It is factory-set for the customer's environment. If the frequency setting is not correct, the CRT display will waver, but otherwise the unit will operate correctly. If the unit should fail to operate properly, please contact Atlantic Research Corporation for instructions.

3.4 DATA LOGIC AND STOP BIT SELECTION

Data logic may be inverted on the Parameter 1 menu after power-up (see Section 17.1).

The number of stop bits (one, one and a half, or two) in asynchronous operation is selected on the Parameter 1 menu after power-up (see Section 15.7).

3.5 SETUP

Slide the window on the power connector to the right to expose the connector pins, and connect the power cord to the COMSTATE II.

Rotate the handle to the position shown in Figure 3-3 by pressing inward on the handle pivots while you rotate the handle. Release pressure on the pivots and, if necessary, move the handle until the detents lock in place.

The front panel contains the keyboard. Support the panel while you open it by lifting up the rear edge of the black latch and pulling it forward. Then lower the panel gently to the work surface.

WARNING: Be sure to connect the COMSTATE II only to a properly grounded power source.

Connect the power cord to a three-wire grounded power outlet. The power cord supplied connects the protective ground wire to the COMSTATE chassis.

CAUTION: When you power up the instrument, be sure that the fan in the rear runs.

3.6 DATA CONNECTORS

On the rear of the unit, as shown in Figure 3-1, are four standard RS-232/V.24 data connectors.

There is one MONITOR connector. For passive monitoring, connect it to the line in both directions using the ribbon T-cable supplied with the COMSTATE II, or using your patch system.

Please read Sections 39 and 40 before you connect either of the EMULATE connectors to your system. The EMULATE DTE (TO MODEM) connector is used in Emulate DTE Mode to transmit on TD and receive on RD. The EMULATE DCE (TO TERMINAL) connector is used in Emulate DCE Mode to transmit on RD and receive on TD.

The fourth RS-232 connector (labeled PRINTER/REMOTE) is intended only for certain special functions, which are explained in Sections 38 and 50.

To monitor data played back from the COMSTATE II's integral tape, see Section 33.

Figure 3-3

4 RS-232/V.24 STATUS INDICATORS

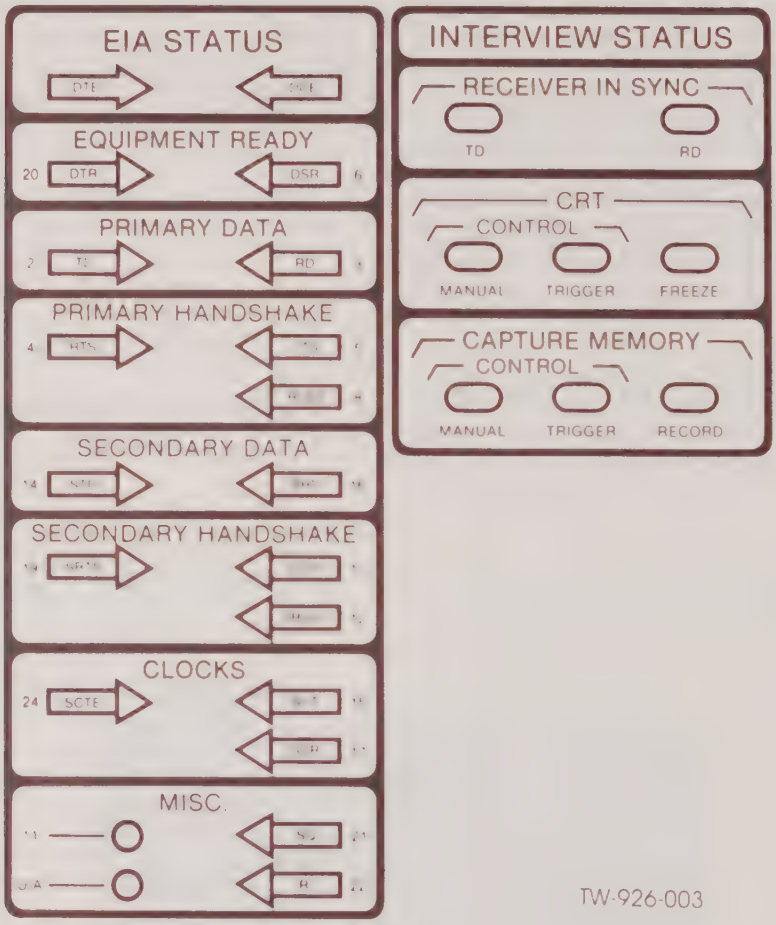

EIA STATUS
DTE
EQUIPMENT READY
20 DTR
DSR
PRIMARY DATA
PRIMARY HANDSHAKE
4 RTS
SECONDARY DATA
SECONDARY HANDSHAKE
CLOCKS
24 SCTE
MISC.
INTERVIEW STATUS
RECEIVER IN SYNC
TD
RD
CRT
CONTROL
MANUAL
TRIGGER
FREEZE
CAPTURE MEMORY
CONTROL
MANUAL
TRIGGER
RECORD
TW-926-003

Figure 4-1

4
RS-232/V.24 STATUS INDICATORS

On the front panel of the COMSTATE II (see Figure 4-1) are two groups of Light-Emitting Diode (LED) status indicators. The left side of the status panel, headed EIA STATUS, displays the status of the data and control leads on the RS-232/V.24 interface.

There are specific indicators for 17 RS-232/V.24 data, clock, and control leads. In addition, there is an indicator for Pin 11 and one other, labeled U/A (User Assignable) that can be assigned to any lead. Thus, the status of any data, clock, or control lead defined by the RS-232/V.24 standard can be observed.

The EIA STATUS display is arranged to identify the source of each signal and to group corresponding signals. In the left-hand column, headed DTE (Data Terminal Equipment), are the indicators for signals from the DTE; in the right-hand column, headed DCE (Data Circuit-terminating Equipment), the indicators for signals from the DCE.

Below these headings the indicators are grouped logically by function, as shown in Table 4-1.

The EIA status LEDs are ON for input voltages greater than approximately +3 V; that is, for control leads in the ON state or data leads in the space state. When the data source is line, they are all active. When the source is tape, and EIA lead status has been recorded, the TD, RD, DTR, DSR, RTS, CTS, RI, RLSD, SCT, SCR, and U/A indicators are active; but if EIA lead status has not been recorded, then only TD, RD, SCT, and SCR are active.

TABLE 4-1
EIA STATUS PANEL

DTE	DCE
EQUIPMENT READY Group	
Pin 20, DTR: Data Terminal Ready EIA = CD CCITT = 108.2	Pin 6, DSR: Data Set Ready EIA = CC CCITT = 107
PRIMARY DATA Group	
Pin 2, TD: Transmitted Data EIA = BA CCITT = 103	Pin 3, RD: Received Data EIA = BB CCITT = 104
PRIMARY HANDSHAKE Group	
Pin 4, RTS: Request to Send EIA = CA CCITT = 105	Pin 5, CTS: Clear to Send EIA = CB CCITT = 106
	Pin 8, RLSD: Received Line Signal Detect (Carrier Detect) EIA = CF CCITT = 109
SECONDARY DATA Group	
Pin 14, STD: Secondary Transmitted Data EIA = SBA CCITT = 118	Pin 16, SRD: Secondary Received Data EIA = SBB CCITT = 119
SECONDARY HANDSHAKE Group	
Pin 19, SRTS: Secondary Request to Send EIA = SCA CCITT = 120	Pin 13, SCTS: Secondary Clear to Send EIA = SCB CCITT = 121
	Pin 12, SRLSD: Secondary Received Line Signal Detect EIA = SCF CCITT = 122

(continued)

TABLE 4-1 (continued)

DTE	DCE
CLOCKS Group	
Pin 24, SCTE: Serial Clock Terminal Source EIA = DA CCITT = 113	Pin 15, SCT: Serial Clock Transmit EIA = DB CCITT = 114 Pin 17, SCR: Serial Clock Receive EIA = DD CCITT = 115
MISC. Group	
Pin 11: Originate Mode EIA = CY CCITT = 126/127 Select transmit frequency or select receive frequency; used in BELL 103F-Type Data Sets.	Pin 21, SQ: Signal Quality Detector EIA = CG CCITT = 110 Pin 22, RI: Ring Indicator EIA = CE CCITT = 125
U/A: User Assigned May be connected to any control lead The U/A indicator is then assigned to the strapped pin, and if interface status is recorded, its status will be recorded and displayed during playback.	

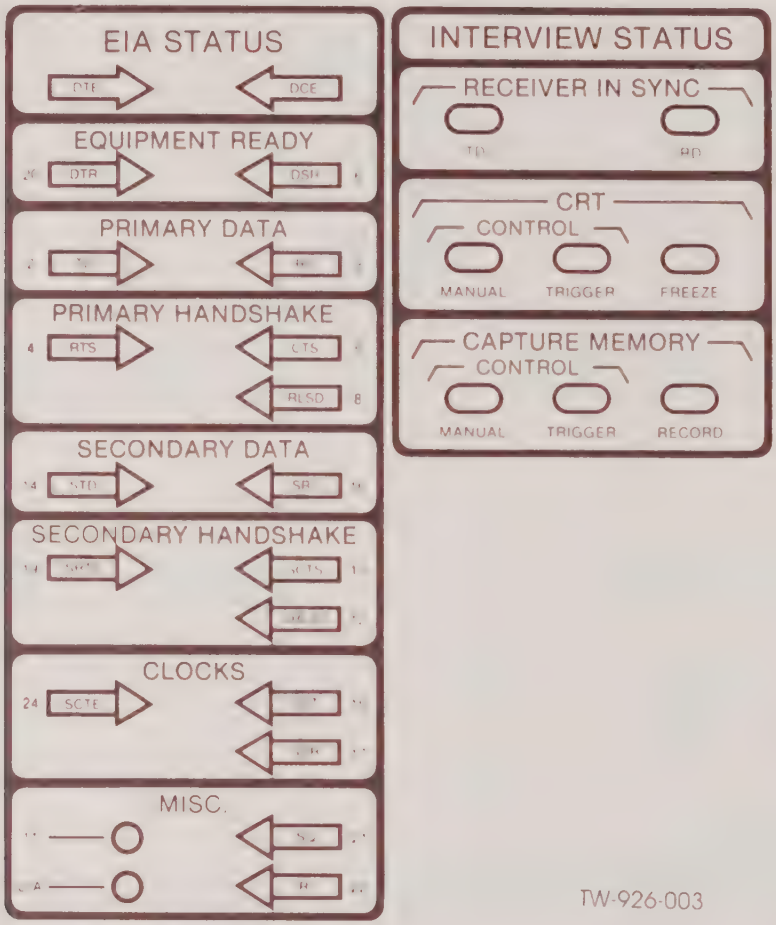

EIA STATUS
DTE
DCE
EQUIPMENT READY
DTR
DSR
PRIMARY DATA
PRIMARY HANDSHAKE
RTS
CTS
RLSD
SECONDARY DATA
SECONDARY HANDSHAKE
CLOCKS
SCTE
MISC.
INTERVIEW STATUS
RECEIVER IN SYNC
TD
RD
CRT
CONTROL
MANUAL
TRIGGER
FREEZE
CAPTURE MEMORY
CONTROL
MANUAL
TRIGGER
RECORD
TW-926-003

Figure 5-1

5
INTERVIEW STATUS INDICATORS

The right-hand section of the COMSTATE II's status panel (see Figure 5-1) has indicators for the status of the trigger logic RECEIVERS, the CRT, and the CAPTURE MEMORY (the COMSTATE II's tape and optional high-speed memory).

5.1 RECEIVER IN SYNC

The RECEIVER IN SYNC indicators, labeled TD for Transmitted Data and RD for Received Data, are ON when their respective trigger logic receivers (refer to Figure 2-1) are "in sync" while monitoring synchronous or bit-oriented protocols. For example, the appropriate indicator is turned on when the synchronization character sequence is encountered in synchronous protocols and remains on until OUTSYNC (see Section 15.3) is encountered. It is possible for the receivers to be in synchronization but not updating the data on the CRT because the display has been frozen (see Sections 10 and 21.4) or the data is suppressed (see Section 18.3).

When asynchronous protocols are being monitored, the RECEIVER IN SYNC indicators are OFF.

NOTE: These indicators do not indicate status of the separate receivers for the Capture Memory.

5.2 CRT

There are three indicators to show the status of the CRT control logic: TRIGGER, MANUAL, and FREEZE.

(a) Trigger Control. When the trigger LED is ON, the real-time CRT display is being stopped (frozen) or started (unfrozen) by triggers (see Section 21.4). This is the default condition when Run Mode is entered, even if no triggers have been programmed.

(b) Manual Control. When the MANUAL indicator is ON, the CRT display is under manual control and has been stopped or started using the CRT MANual FReeZe or the CRT MANual UNFReeZe key. These manual keys override trigger control until the CRT CONTinue TRIGger key is operated. Leaving Run Mode cancels manual control.

(c) Freeze. When the FREEZE LED is ON the real-time CRT display has been stopped (frozen) and no new data is being added to the display. This may be the result of either a manual action or a trigger action as indicated by the MANUAL or TRIGGER CRT control indicator.

5.3 CAPTURE MEMORY

If the high-speed random access memory (RAM) is installed in the unit, the CAPTURE MEMORY indicators display status of either TAPE or RAM, whichever is selected on the Record Control menu (Parameter 2; see Section 33.2) or as data source (Parameter 1; see Section 13.4). Otherwise, tape status is shown. There are three Capture Memory LEDs, which operate in much the same manner as the CRT indicators.

The Capture Memory is separate from and should not be confused with the CRT Display Buffer.

(a) Trigger. The TRIGGER control LED is ON when the Capture Memory is being started and stopped by triggers (see Section 33.4). This is the default condition when Run Mode is entered, even if no triggers have been utilized.

(b) Manual. When the MANUAL control indicator is on, the Capture Memory has been started or stopped using the MEMory MANual START or MEMory MANual STOP key and is now under manual control. These manual keys override the trigger controls until the MEMory CONTinue TRIGger key is operated. Leaving Run Mode also cancels manual control.

When SOURCE: TAPE, TAPE/CRT, or RAM has been selected on the Parameter 1 menu, the CRT and CAPTURE MEMORY controls are tied together. Freezing the display stops the Capture Memory playback also. This enables you to look at data in the buffer without loss of data to counters and timers or the data buffer. Similarly, when CRT control is returned to the triggers, both the CRT and Capture Memory will be affected. You can observe the STATUS LEDs while you operate the CRT and MEM control keys to see how this operates.

When SOURCE: LINE has been selected on the Parameter 1 menu, the CRT and MEM controls operate independently and data will continue to be recorded whether or not the CRT is frozen. Thus, the Capture Memory will continue to record when the CRT is frozen and the CRT will continue to display data when the Capture Memory is not recording.

(c) Record. The RECORD indicator is ON when data is being entered in the Record Buffer of the Capture Memory. This may be the result of a manual action or a trigger action, as indicated by the MANUAL or TRIGGER control indicator, or it may be the result of the initial Record Control condition selected on the Parameter 2 menu (see Section 33.2). If no selections have been made on the Record Control (Parameter 2) menu, the default condition of the Capture Memory when the COMSTATE II enters Run Mode is NOT RECORD, and the RECORD indicator is OFF.

NOTE: The RECORD LED does not necessarily indicate that the tape is moving. The cartridge recorder uses a buffered recording technique to make maximum use of the tape by recording at the highest allowable density. The tape only moves when data is being transferred from the buffer to the tape. At low data rates, the tape may remain stationary for several minutes at a time while the buffer is being filled. The RECORD LED indicates that data is being entered into the record buffer.

Figure 6-1 The Keyboard

6
THE KEYBOARD

6.1 INTRODUCTION

This section is organized by key, rather than by function, because it is intended as a reference source, rather than a procedural instruction. You can use it to gain overall familiarity with the keyboard, and turn to it whenever you want specific information. A diagram of the COMSTATE II keyboard is included as Figure 6-1.

Key functions are identified by grouping and color. Many keys are valid in several modes, but the colors indicate their primary functions. Bright blue keys are primarily Program Mode keys; slate blue keys, Run Mode. Light gray keys represent the standard ASCII keyboard. Most are alphanumeric characters; many are used for hexadecimal entries and protocol characters. Dark gray keys are special use keys.

In addition to the characters shown on the ASCII keyboard, the following can be obtained by using the CTRL key: CTRL-8 gives [; CTRL-9,]; CTRL-6, {; CTRL-7, } ; CTRL-0, | ; and CTRL-\, ~.

> NOTE: Even if the 0 (zero) key on your keyboard is labeled |, SHIFT-0 gives ^ and CTRL-0 gives | .

Two keys -- CAPS LOCK and HEX -- may be locked ON or OFF. The red LED on the key is illuminated when either key is in the ON position. To turn either key OFF, simply depress it again. The HEX LED refers to the keyboard status only. In Run Mode, it does not indicate that the display is set to hexadecimal.

A displayed message, KEY ERROR, accompanied by a series of "beeps" calls attention to illegal key use.

Keyboard translation tables for the seven codes standard in the COMSTATE II as well as Baudot are included as Appendix A.

6.2 PROGRAM MODE KEYS: BRIGHT BLUE

Key	Program Mode	Run Mode	
		Real Time	Freeze
PROGRAM		Places COMSTATE II in Program Mode, enables all bright blue (program) keys, and displays the Program Selection menu.	
PARAM	PARAM followed by number of a menu listed on the Program Selection screen displays that menu.	Not valid	Not valid
STATE TEST A STATE TEST B	Selects the State Summary and Entry screen for Test A or B, respectively.	Not valid	Not valid
TRIG	Selects Trigger Summary for current State. TRIG followed by any number from 0 through 7 and then the C key displays the trigger Conditions menu for the corresponding trigger in the current state; TRIG followed by a number from 0 through 7 and A displays a trigger Actions menu for the current state. TRIG followed by any number from 0 through 7 and then the D key clears both the Conditions and Actions menus for that trigger and withdraws the trigger from the current state.	Not valid	Not valid

(continued)

6.2 PROGRAM MODE KEYS: BRIGHT BLUE (continued)

Key	Program Mode	Run Mode: Real Time	Run Mode: Freeze
SPRD SHEET	Displays protocol spread sheet screen for Test A or Test B.	Not valid	Not valid
MSG	Displays Message Summary Followed by any number from 0 through F, displays message-entry menu.	With data or trace displayed, enables Keyboard Buffer so that message can be entered. Transfers contents of Keyboard Buffer to the Keyboard Transmit Buffer and closes Keyboard Buffer when pressed a second time.	Not valid
ENTER	Always advances cursor to the next field on the menu, whether on the same line or the next. From bit mask field, returns cursor to next character in string or "1 of" list or in "Enhance" or "Suppress" list. While a trigger Conditions menu is displayed, CTRL-ENTER brings up the Actions menu for that trigger; if Actions menu is displayed, CTRL-ENTER brings up Conditions menu.	If data source is Line, ENTER puts a blinking bright reverse-image marker on the CRT at the current location. This marker can be sensed by triggers. If interface lead status is being recorded on tape, then the marker (i.e., the ENTER key status) is also recorded. If data source is Tape, ENTER only valid for Keyboard Buffer entries. When Keyboard Buffer is open, ENTER transfers Keyboard Buffer content to Keyboard Transmit Buffer without closing Keyboard Buffer.	Not valid

(continued)

6.2 PROGRAM MODE KEYS: BRIGHT BLUE (continued)

Key	Program Mode	Run Mode: Real Time	Run Mode: Freeze
SAVE PROG	For program-data tapes, moves tape to program storage area and records the current program on the tape. For multiple-program tapes, displays the tape directory menu. To record current program on the tape, press key again.	Not valid	Not valid
LOAD PROG	For program-data tapes, moves tape to program storage area and loads program from the tape into COMSTATE II program memory. For multiple-program tapes, displays the tape directory menu. When the program number has been entered, press key again to load program currently selected on the menu into COMSTATE II program memory.	Not valid	Not valid

6.3 RUN MODE KEYS: SLATE BLUE

Key	Program Mode	Run Mode	
		Real Time	Freeze
RUN	Sets the unit in Run Mode from any Program Mode display and starts test. Enables all other Run Mode keys.	Except after operation of the HALT key, resets all counters and timers, forces receivers out of synchronization, and restarts the test. Returns the unit to State 0 of both Test A and Test B and resets flags. Does not move tape to the initial block number or initialize RAM. After HALT, restarts the test and forces the receivers out of synchronization without resetting counters and timers. Does not move tape to the initial block number or initialize RAM.	
DATA	Not valid	Displays real-time data or frame or packet protocol from the selected source.	Restores data when Trace or Counters and Timers are displayed. Repeated operation of DATA alternately displays 64 and 32 characters per line.
TRACE	Not valid	Not Valid	Intended for use with bit-oriented protocols. Displays Frame Trace mnemonics. To display Packet Trace mnemonics, press TRACE again or operate CTRL-TRACE.
CNTR-TMR	Not Valid	Displays real-time counters and timers (unit remains in Run Mode and program continues to operate).	

(continued)

6.3 RUN MODE KEYS: SLATE BLUE (continued)

Key	Program Mode	Run Mode	
		Real Time	Freeze
HALT	Not valid	Suspends all Run Mode operation, including counters and timers. Stops Capture Memory playback or recording (whether tape or RAM). Data stops being added to display; no change in format of display. To resume Run Mode operation without resetting counters and timers or restarting RAM or tape, press RUN once.	
CRT MAN UNFRZ	Not valid	Restarts real-time data display, if display was frozen. Overrides trigger control of CRT freeze. Turns off FREEZE status LED; turns ON MANUAL status LED.	
CRT MAN FRZ	Not valid	Stops real-time data display. Gives special Manual Freeze display format; enables special Manual Freeze functions. Overrides trigger control of display. In playback mode, stops playback. Turns on the FREEZE and MANUAL status LEDs.	
CRT CONT TRIG	Not valid	Returns control of display to triggers after CRT MAN UNFRZ or CRT MAN FRZ. Turns off MANUAL status LED; turns on TRIGGER status LED. (If FREEZE LED comes on, triggers have frozen display.)	
CRT CLEAR	Not valid	Clears the CRT screen (and entire 32,768-character buffer) of old data momentarily.	
MEM MAN START	Not valid	Causes tape or RAM to start recording (or playback): overrides trigger control. Turns on RECORD status LED and MANUAL status LED.	

(continued)

6.3 RUN MODE KEYS: SLATE BLUE (continued)

Key	Program Mode	Run Mode	
		Real Time	Freeze
MEM MAN STOP	Not valid	Causes tape or RAM to stop recording (or playback); overrides trigger control. Turns off RECORD status LED; turns on MANUAL status LED.	
MEM CONT TRIG	Not valid	Returns control of tape or RAM to triggers. Turns off MANUAL status LED. If RECORD LED comes ON, a trigger has turned on the tape or RAM.	

6.4 SPECIAL KEYS: DARK GRAY

Key	Program Mode	Run Mode: Real Time	Run Mode: Freeze
F1 through F8 (function keys)	These "soft" keys correspond to the condition and action menus at the bottom of the protocol spread-sheet screen. Use soft keys to enter a test program on spread sheet. Menu selections change when you make a selection, move cursor, or press -MORE- (F8).	Not valid	Not valid
FLAG	Enters Flag byte (7E, hex) for HDLC framing with zero bit stuffing (The key sequence HEX 7 E will not be read as a flag.)	Not valid	Not valid
ALT	ALT followed by another Key alters function of ASCII keys as follows: In trigger Transmit Text field. ALT followed by (uppercase) M selects factory-stored Fox message; ALT (uppercase) R selects Receive Buffer; ALT (uppercase) K selects Keyboard Buffer; and ALT (uppercase) T, U, V, and W, a Transmit Variable. ALT-0 (zero) through 9 and ALT (uppercase) A through F Message-Entry menus 0 (zero) through F, respectively.	Not valid	Not valid
STATE NEXT TRIG	Moves to next trigger in current state on protocol spread-sheet screen. When final trigger in state is reached, this key adds trigger (up to eighth trigger).	Not valid	Not valid

(continued)

6.4 SPECIAL KEYS: DARK GRAY (continued)

Key	Program Mode	Run Mode: Real Time	Run Mode: Freeze
STATE NEXT TRIG (cont.)	CTRL-STATE NEXT TRIG moves from state to state on spread sheet; then adds state.		
PRINT	Outputs designated data or program at PRINTER/REMOTE interface.	Not Valid	Outputs current display on printer interface. CTRL-PRINT will print contents of entire CRT buffer.
XEQ	In units with high-speed memory (RAM) option, when Parameter 3 menu is displayed, transfers data between RAM and Tape. With Parameter 5 menu displayed, starts formatting, duplicating, or retensioning of tape, or saving CRT data to tape. With Parameter 7 menu displayed sets real-time clock. With Parameter 8 menu displayed executes selected Remote Transfer functions or puts COMSTATE II in Terminal Mode.	Not valid	Not valid
CURSOR ARROWS	When an arrow key is held down, the cursor will move continuously until the key is released or until it can no longer logically move in that direction.		
	UP or DOWN arrow moves the cursor up or down to the current selection in the first field on the next line, or to the first position in the field, if choices are to be typed in. (See also ENTER key, Section 6.2.)	In tape playback mode, each operation of UP arrow doubles playback speed to a maximum of 9.6 kbps; each operation of the DOWN arrow halves the speed.	NOTE: When display is frozen, cursor will be at last character of the new data. UP or DOWN arrow moves the cursor up or down to the next line. At top or bottom of CRT window, pulls the next line from

(continued)

6.4 SPECIAL KEYS: DARK GRAY (continued)

Key	Program Mode	Run Mode: Real Time	Run Mode: Freeze
CURSOR ARROWS (cont.)			the buffer onto the display.
	RIGHT or LEFT arrow moves the cursor right or left to the next permitted selection or to the next field. (See also ENTER key, Section 6.2.)	Except for RAM playback, RIGHT and LEFT arrows valid only for keyboard buffer.	RIGHT or LEFT arrow moves the cursor right or left to the next character or beginning (or end) of next (or preceding) line.
	If cursor is in a window selection field, RIGHT arrow displays next selection; LEFT arrow displays preceding selection in window. (See also ROLL key, Section 6.4.)	During RAM playback, LEFT arrow backs playback up 1 block.	
	Use CTRL-ARROW simultaneously to move cursor directly to last (or first) field or selection in current arrow direction.	CTRL-ARROW valid only for Keyboard Buffer.	CTRL-UP (DOWN) ARROW displays previous (or next) page in CRT buffer.
	On protocol spread-sheet screen, RIGHT or LEFT ARROW moves cursor one space, while SHIFT-RIGHT or -LEFT (or CTRL-RIGHT or -LEFT) moves cursor one area. UP and DOWN move cursor one line. SHIFT-UP and SHIFT-DOWN (or CTRL-UP or -DOWN) perform two distinct actions: in CONDITIONS, ACTIONS, or NEXT STATE areas, cursor moves from trigger to trigger. But in CURRNT STATE area, cursor moves from state to state.		CTRL-RIGHT (LEFT) ARROW moves cursor to end (beginning) of line of data.
HEX	While HEX LED is ON, (except for control characters,	Successive operation places the CRT alternately in and out of hexadecimal display mode (HEX LED remains OFF).	

(continued)

6.4 SPECIAL KEYS: DARK GRAY (continued)

Key	Program Mode	Run Mode: Real Time	Run Mode: Freeze
HEX (cont.)	which are also permitted) only hexadecimal data entries are accepted. Only keys 0 (zero) through F are legal and all data entries are shown in hexadecimal. HEX LED can only be turned ON in a field which accepts hexadecimal entries. May be turned OFF at any time. NOTE: HEX LED is automatically turned OFF when the unit enters Run Mode.	HEX LED ON refers to entries made into the Keyboard Buffer only. CTRL-HEX displays all, and only, control characters in the selected code font in hexadecimal.	Not Valid
BIT MASK	Displays the MASK entry field so that all characters having like bit status at designated bit positions may be selected. Cursor moves to bit 8 position of MASK entry field. May be used on Parameter 2 menu in Suppress and Enhance fields, on Trigger Conditions menus in "STRG" and "1 OF" fields.	Not valid	Not valid
≠ (NOT EQUAL)	≠ followed by a character or a Bit Mask, selects all characters not equal to the character or Bit Mask. May be used on the Parameter 2 menu in the Suppress and Enhance fields and on the Trigger Conditions menus in the "STRG" and "1 OF" fields, and on the Parameter 9 menu in the START/INCL field, and on the Parameter C menu in the constant definition field.	Not valid	Not valid

(continued)

6.4 SPECIAL KEYS: DARK GRAY (continued)

Key	Program Mode	Run Mode	
		Real Time	Freeze
DON'T CARE	Enters Don't Care character in a string: any character in this position will satisfy the string.	Not valid	Not valid
CLEAR FIELD	Clears current entries in any data-entry field. CTRL-CLEAR FIELD clears the current program menu to its default values. On protocol spread-sheet screen, CLEAR FIELD clears current line in current area. Does not clear across area boundaries. SHIFT-CLEAR FIELD clears line from cursor position only. With the State Summary and Entry screen displayed, CTRL-CLEAR FIELD will clear the summary and all trigger Conditions and Actions menus and states in that test. SHIFT-CLEAR FIELD clears all entries in the current data-entry field from the cursor position to the end of the field.	Clears Keyboard Buffer. Clears Prompts from Line 2. With Trigger Summary displayed, CTRL-CLEAR FIELD clears the summary and all trigger Conditions and Actions menus in current State to default condition.	Not valid CTRL-CLEAR FIELD clears Keyboard Buffer and associated Transmit Buffer. SHIFT-CLEAR FIELD clears Keyboard Buffer from cursor location to end.
DEL CHAR INSRT	On protocol spread-sheet screen, inserts space before cursor position. With SHIFT, inserts space after cursor. With CTRL, deletes character at cursor.	Not valid	Not valid

(continued)

6.4 SPECIAL KEYS: DARK GRAY (continued)

Key	Program Mode	Run Mode	
		Real Time	Freeze
DEL LINE INSRT	On protocol spread-sheet screen, inserts line above cursor. With SHIFT, inserts line below cursor. With CTRL, deletes line at cursor.	Not valid	Not valid
DEL TRIG INSRT	On protocol spread-sheet screen, inserts trigger above cursor. With SHIFT, inserts trigger below cursor. With CTRL, deletes trigger.	Not valid	Not valid
DEL STATE INSRT	On protocol spread-sheet screen, inserts state above cursor. With SHIFT, inserts state below cursor. With CTRL, deletes state.	Not valid	Not valid
DUP	Not used	Not used	Not used
ROLL	Displays next selection in a window data-selection field. Within frame and packet window fields, the TYPE: OTHER selection has a numeric data-entry field (00). When OTHER is displayed, pressing the ROLL key will move the cursor one digit to the right. To display the next selection, press ROLL a second time. CTRL-ROLL or SHIFT-ROLL displays previous selection in a window data-selection field.	Not valid	Not valid

6.5 ASCII AND HEXADECIMAL KEYS: LIGHT GRAY

Key	Program Mode	Run Mode: Real Time	Run Mode: Freeze
Light Gray Keys	Alphanumeric characters (including those used for hexadecimal entry), control characters, special symbols. See Section 6.1 for characters not shown on ASCII keyboard. May be used to enter any trigger on protocol spread-sheet screen. On spread sheet, RETURN key has special function: it adds line to trigger area.	All alphanumeric and control character keys can be enabled for making keyboard buffer entries by the MSG key. When Keyboard Trigger Condition has been selected, depressing appropriate alphanumeric or control character key will activate trigger while state is active.	When data is displayed, B moves the CRT window to the beginning of the buffer; E moves the CRT window to the End of the buffer. The next four paragraphs are valid for 7E/X.25, BSC/X.25, SDLC, or SDLC/NRZI: F automatically tabs the cursor to the next Frame-control byte and displays the mnemonic expansion (INFO, RNR, NR, etc.) on line 2. For 7E/X.25 and BSC/X.25 only, P automatically tabs the cursor to the next Packet-type byte and displays the mnemonic expansion (LCN, INFO, RNR, PR, Q, D, M, etc.) on line 2. CTRL-F or CTRL-P (for 7E/X.25 or BSC/X.25) displays the mnemonic expansion for the character at the current cursor position. NOTE: In this case the logic cannot identify invalid actions. On dual-line display, T selects TD, and R selects RD, for all following uses of CTRL-F or CTRL-P. R cancels preceding T and vice versa.

(continued)

6.5 ASCII AND HEXADECIMAL KEYS: LIGHT GRAY (continued)

Key	Program Mode	Run Mode: Real Time	Run Mode: Freeze
SHIFT	Hold SHIFT down while accompanying key, or keys, is operated to give uppercase or special character. If CAPS LOCK is ON and SHIFT is operated, alpha characters will be in lowercase. SHIFT-CLEAR FIELD clears current data field from cursor to end of field.	May be used for keyboard buffer entry.	Invalid
CAPS LOCK (red indicator lights while CAPS LOCK is ON)	ON locks all alpha characters to uppercase (does not lock numeric or special characters).	May be used for keyboard buffer entry.	Invalid
CTRL	Must be held down while accompanying key is operated.	When data is displayed, CTRL-HEX alternately displays all control characters in hexadecimal.	
	Used with an alphanumeric key, gives control character. See Section 6.1 for CTRL-key characters not shown on ASCII keyboard.	May be used for keyboard buffer entry.	
	With CLEAR FIELD key clears the entire displayed menu to default selections.	While keyboard buffer is open, CTRL- CLEAR FIELD clears keyboard transmit buffer as well as keyboard buffer.	
	With CURSOR arrow, moves cursor directly to last position in direction of arrow.		
CTRL-ESC		Sends a BREAK signal in Terminal Mode.	

Figure 7-1

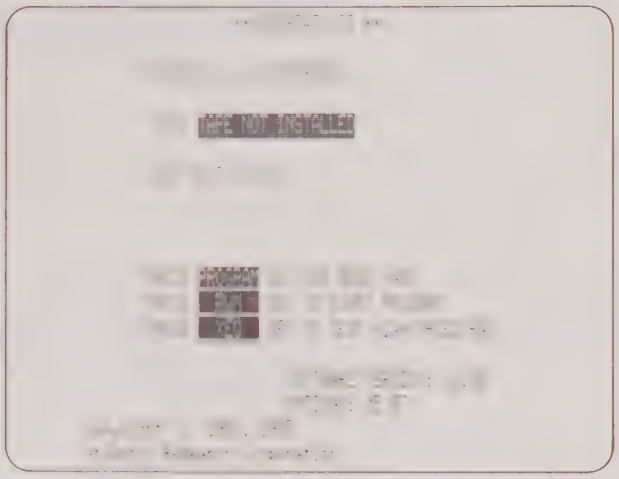


Figure 7-2

7
POWER UP

Please read Section 3 of this manual before you power up the COMSTATE II.

CAUTION: Whenever you power up the COMSTATE II, be sure that the ventilator fan at the rear is running.

7.1 POWER-UP WITHOUT TAPE

Without installing a tape in the drive, press the red POWER switch at the right of the front panel. During the internal diagnostic tests automatically conducted at power-up, the CRT display will be similar to that of Figure 7-1. (Your COMSTATE II may have a different software version or option numbers.) If the optional High-Speed Memory (RAM) is installed, these tests may take up to approximately 45 seconds, depending on which RAM option is present. When the self tests are complete, the display will change to that of Figure 7-2.

The COMSTATE II's default parameters now will be resident in the unit.

The red power switch is an alternate-action key; simply press it a second time to power down the COMSTATE II.

7.2 THE POWER-UP MENU

When the power-up interactive diagnostics among the internal microprocessors are completed, the Power-up menu displays information as follows:

(a) If no tape is installed, the TAPE line displays the message TAPE NOT INSTALLED. If a tape is installed, the message CHECKING TAPE TYPE is displayed while the COMSTATE II ascertains what type of tape it is. (If a program-data tape with a valid COMSTATE II program is found, the unit will automatically load the taped program and go to Run Mode; see Section 36.3.)

NOTE: See Appendix D for explanation of other messages that may be displayed in the TAPE line.

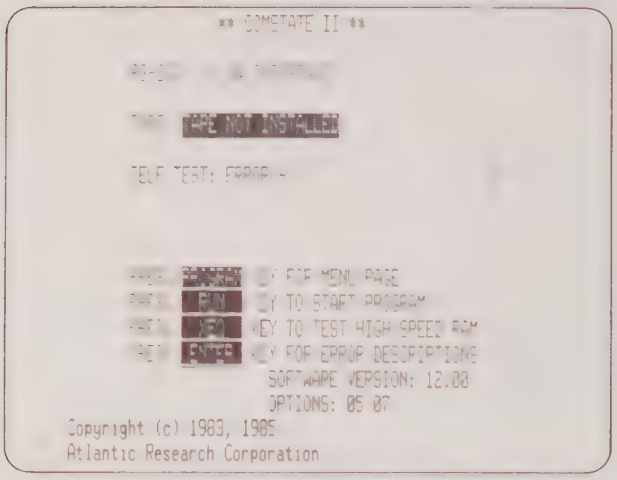


Figure 7-3

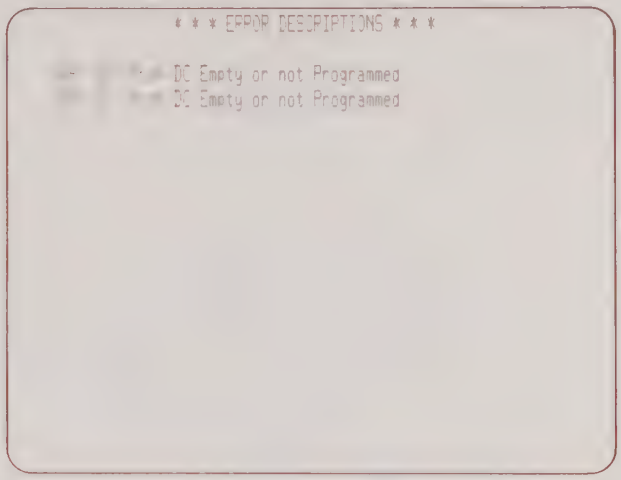


Figure 7-4

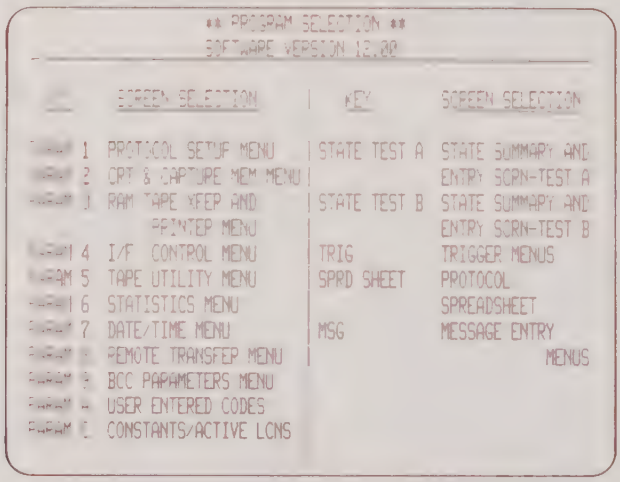


Figure 7-5

(b) If an error is detected during the diagnostic tests, an error code representing the defective assembly will be displayed on the SELF TEST line. Press the ENTER key to display an ERROR SUMMARY which lists the probable board and socket where the error has been found (see Figures 7-3 and 7-4). See Appendix J-1 for further instructions.

(c) As Figure 7-2 shows, you must choose between two keys at this point: PROGRAM and RUN. Other keys will cause a KEY ERROR message on line 2 of the display and an audible signal. KEY ERROR clears after 3 seconds or when a correct key is operated.

The PROGRAM key will display the Program Selection menu (see Section 7.3). You can then use the program menus to manually develop a program, or you can load a taped program (see Sections 36.2 and 36.6). If you press the RUN key, the COMSTATE II will go to Run Mode and expect to monitor data using its default, BISYNC parameters.

(d) You may abort the power-up RAM tests. This is useful if the unit has the 4-Megabit RAM, because the tests may take up to 45 seconds. The tests should not be aborted if you intend to use the RAM during the session. Press the PROG key after the RAM tests are under way (about 8 seconds). The Program Selection menu will be displayed, and you can proceed as explained in Section 7.3.

7.3 PROGRAM SELECTION MENU

When you press the PROGRAM key, the Program Selection menu shown in Figure 7-5 is displayed. The PROGRAM key stops any test in process and returns you to the Program Selection menu. This is the basic directory for using the COMSTATE II. Each of the menus in this directory is explained in this manual under the appropriate topic. Whenever you want to be reminded of the menus in your COMSTATE II, press the PROGRAM key and the Program Selection menu will be displayed. The software version currently in the unit is also displayed on this menu.

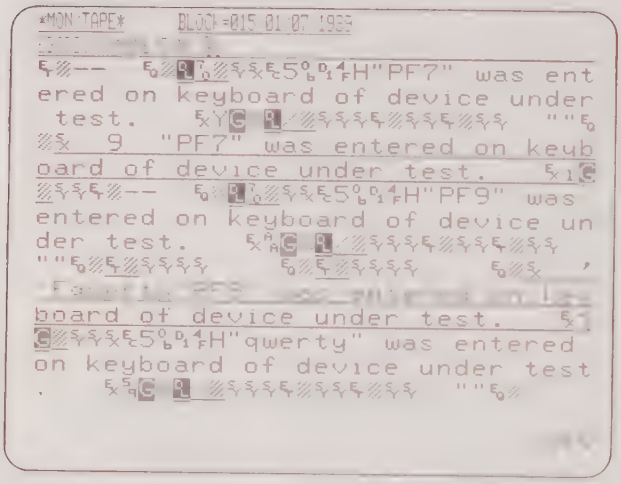


Figure 8-1

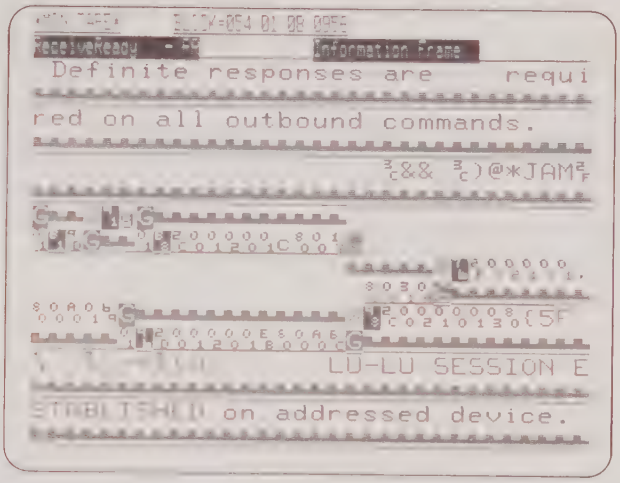


Figure 8-2

8
RUN MODE: DISPLAYS AND ENHANCEMENTS

Sections 8.1 through 8.7 explain display modes that can be selected on the CRT Control menu (Parameter 2; see Section 18). Sections 8.8 through 8.12 describe other display enhancements.

Line 1 of the screen (Figure 8-1) will display the COMSTATE II's operating mode, the SOURCE of the data, the block number at which the Capture Memory is recording or playing back, and the current date and time. On the second line will appear basic parameters from the Parameter 1 program menu. For data displays, if the program includes prompts, they will be displayed on this line. Prompts from triggers in Test A will appear on the left side of the screen. Prompts from triggers in Test B will appear on the right side of the screen (see Figure 8-2).

8.1 SINGLE-LINE DISPLAY

Single-or dual-line display is selected on the Parameter 2 menu (see Section 18).

In single-line display (Figure 8-1), DCE (RD) data and DTE (TD) data are displayed alternately on the same line. They are easily distinguished because DCE data is always underlined (to identify it as originating from the communication line).

8.2 DUAL-LINE DISPLAY

In dual-line display (Figure 8-2), DTE (TD) data begins on the first data line. DCE (RD) data (always underlined) is shown on alternating lines beginning with the second data line. Time correlation between TD and RD is maintained by inserting a low-intensity L-shaped fill symbol. In dual-line display the relationship between the Transmit and Receive data is accurate to within plus or minus 1 character.

8.3 FRAME AND PACKET TRACE DISPLAYS

X.25 FRAME TRACE, X.25 PACKET TRACE, and SDLC TRACE appear as DISPLAY MODE selections on the Parameter 2 menu. These selections are intended for use with bit-oriented protocols including BSC/X.25. When you select any of these display modes, data will not be displayed in Run Mode. Instead, you will see a sequential display of frame-control or packet-type mnemonic expansions (see Section 47.3 for complete descriptions of these displays.)

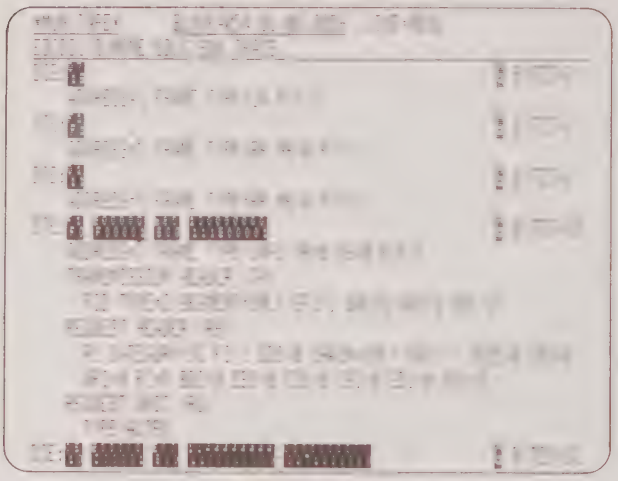


Figure 8-3

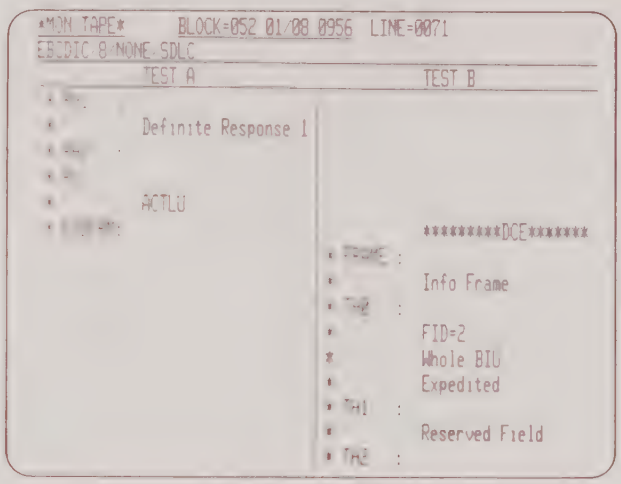


Figure 8-4

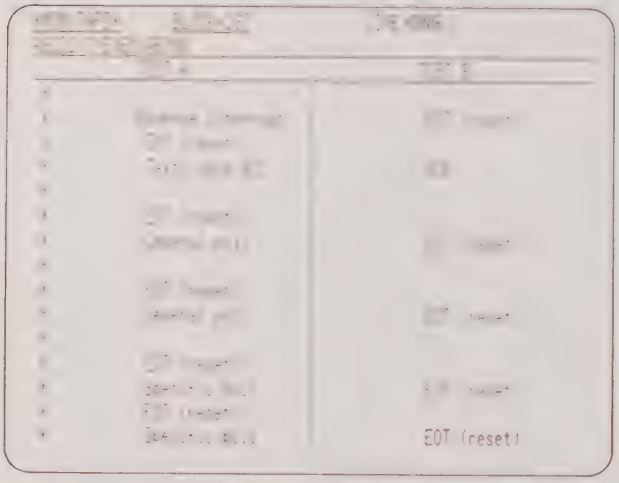


Figure 8-5

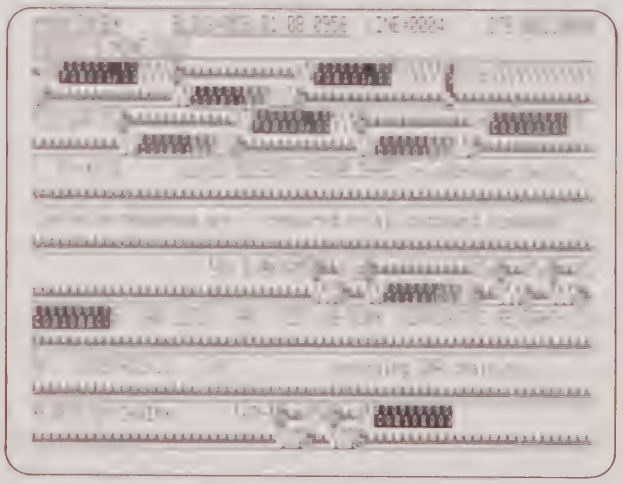


Figure 8-6

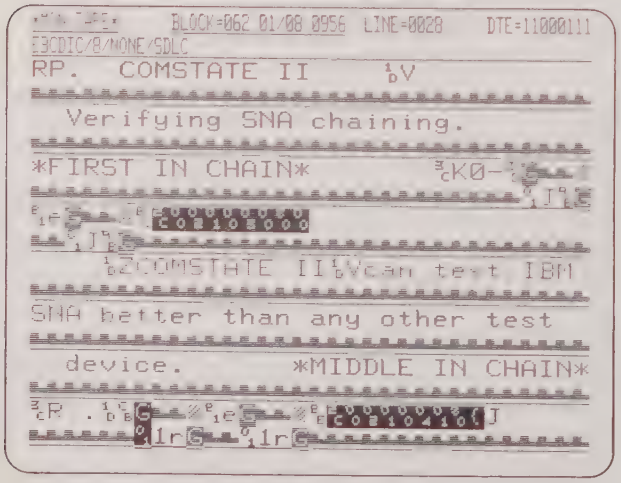


Figure 8-7

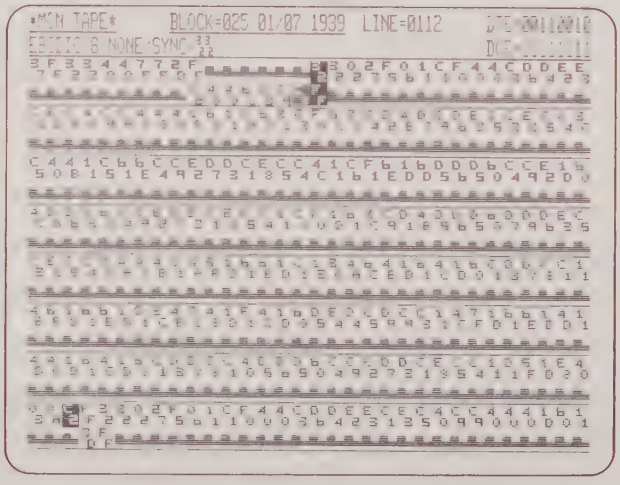


Figure 8-8

When Option 07 is installed in the COMSTATE II, SNA TRACE is also available as DISPLAY MODE. The selection provides a real-time expansion of each frame (see Figure 8-3). Refer to Section 48 for a description of SNA TRACE.

8.4 PROMPT/STATE TRACE DISPLAY

If PROMPT/STATE is selected as the DISPLAY MODE (Parameter 2), a real-time log of all state changes and prompts is displayed while the COMSTATE II is in Run Mode (see Figure 8-4). Test A prompts and state changes are displayed on the left side of the screen; those from Test B on the right side. An asterisk indicates which state change or prompt has occurred first.

8.5 PROMPT TRACE DISPLAY

If PROMPT is selected in the Parameter 2 DISPLAY MODE field, a real-time log of all prompts is displayed on the CRT while the COMSTATE II is in Run Mode (see Figure 8-5). Test A prompts are displayed on the left side of the screen; Test B prompts on the right side. An asterisk indicates which prompt has occurred first.

8.6 64-CHARACTER DISPLAY

Characters per line (CHARS/LINE) may be selected on the Parameter 2 menu. If 64 characters per line has been selected, the COMSTATE II CRT can display 1024 characters (16 lines of 64 characters each; see Figure 8-6).

8.7 32-CHARACTER DISPLAY

If 32 characters per line has been selected on the Parameter 2 menu, the COMSTATE II CRT can display 512 characters (16 lines of 32 characters each; see Figure 8-7).

8.8 HEXADECIMAL DISPLAY

To display all data in hexadecimal, press the red HEX key once (see Figure 8-8); to return to the original text display, press HEX again.

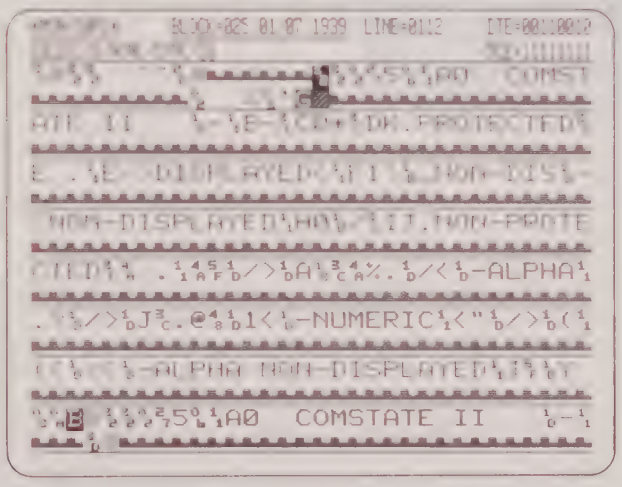


Figure 8-9

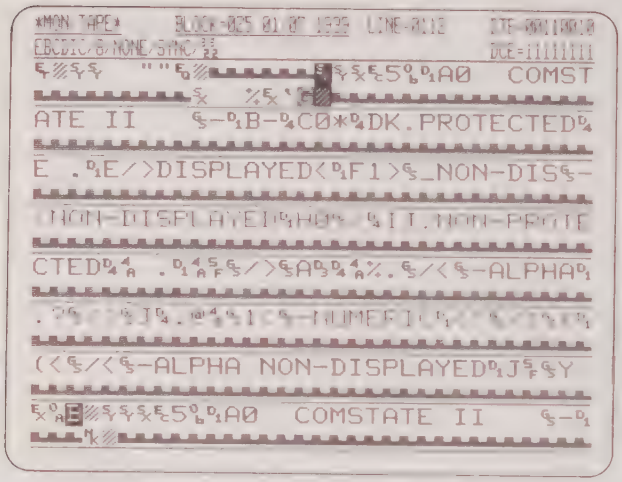


Figure 8-10

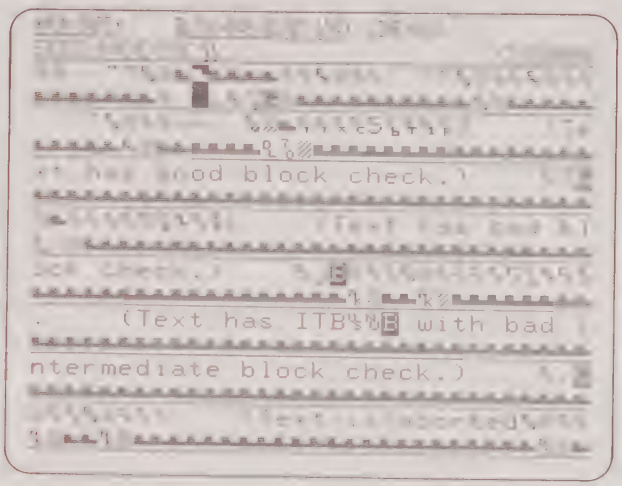


Figure 8-11

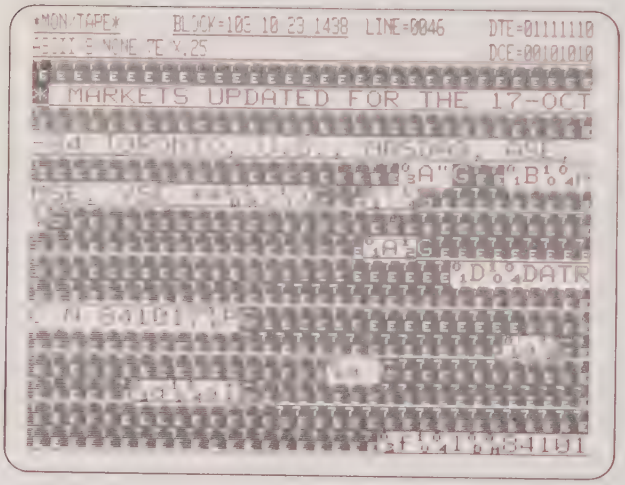


Figure 8-12

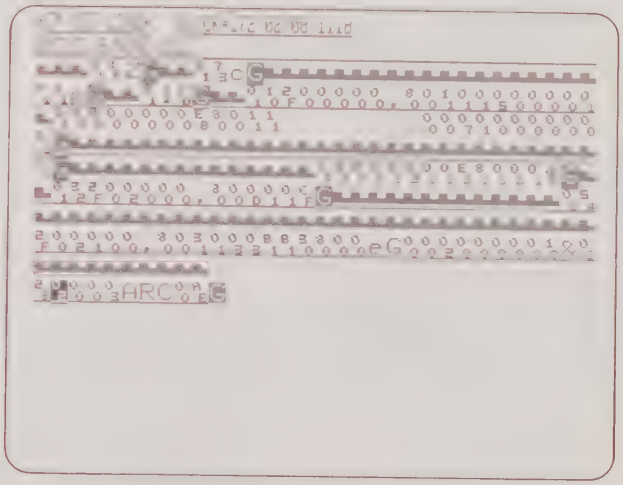


Figure 8-13

To display only control characters in hexadecimal (see Figure 8-9), hold the CONTROL key down while you operate the HEX key. To restore the original text, press CONTROL-HEX again (see Figure 8-10).

For 7E/X.25 and SDLC formats, the default condition is to display protocol characters in hexadecimal (though code-conversion will occur for protocol characters hex-40 and higher). The HEX key displays all data in hexadecimal, and CONTROL-HEX restores the original (default) text.

8.9 BLOCK CHECK CHARACTERS

When Received Block Check is ON in the unit (see Section 16), a Good block check is represented on the display by a low-intensity reverse-image letter G replacing the last block check character. For a Bad block check, the last block check character is replaced by a bright reverse-image B. An aborted block is followed by a bright reverse-image A. (Figure 8-11 shows both good and bad block checks.)

8.10 FLAGS

The Flag byte, 7E (hex), used for framing 7E/X.25 and SDLC protocols is displayed as low-intensity reverse-image 7E to distinguish it from transparent data 7E (see Figure 8-12).

8.11 MARKER

In Run Mode, when the data source is not tape, the ENTER key can be used to mark incoming data when it first appears on the screen. The last character received before ENTER is depressed will appear in blinking bright reverse image. If you freeze the display with the CRT MANUAL FREEZE key while the marked characters are still in the CRT buffer, the markers will remain and you will then be able to study the data of interest (Figure 8-13). The marker may be recorded on tape (see Section 33.2f), or sensed by triggers (Section 20.16).

8.12 OTHER HIGHLIGHTS

Other data highlights include reverse, low-intensity, and blink. They are chosen in Program Mode (see Sections 18.4 and 21.4).

TABLE 9-1
COUNTERS, TIMERS, AND CAPTURE MEMORY OPERATION IN RUN MODE

Keys	Counters and Timers	Timeout Timer	Capture Memory	
			Data Playback	Recording
RUN				
In Program Mode	Reset	---	Starts	Starts as commanded
In Run Mode	Reset	Stops	Continues	Continues as commanded
In Halt Mode	Continue as commanded	Stops	Continues	Continues as commanded
DATA	Continue as commanded	Continues as commanded	Continues	Continues as commanded
TRACE (Note 1)	Continue as commanded	Continues as commanded	Continues	Continues as commanded
CNTR/TMR	Continue as commanded	Continues as commanded	Continues	Continues as commanded
HALT	Stop; do not reset	Stops	Stops	Stops
FREEZE				
Line data	Continue as commanded	Continues as commanded	---	Continues as commanded
Recorded data	Stop; do not reset	Continues as commanded	Stops	---
CRT CLEAR	Continue as commanded	Continues as commanded	Continues	Continues as commanded

Note 1: The TRACE key is operative in Freeze Mode only.

9
OTHER DISPLAY CONTROL

9.1 RUN KEY

The RUN key may have different actions. Table 9-1 summarizes most of its functions.

(a) Program Mode. When an appropriate program has been loaded and a data source connected, press the RUN key to begin the test. This sets the unit in Run Mode from any Program Mode display.

(b) Run Mode. To restart the test at any time without leaving Run Mode, press the RUN key. This forces the receivers out of synchronization, resets all counters and timers, restarts the tests, and returns the unit to State 0 of both tests. Whether the Capture Memory is recording or playing back data, RUN does not cause the tape to rewind or initialize the RAM.

(c) Halt Mode. To resume program activity after HALT (see Section 9.2), press RUN once. All monitor and test activities will simply resume from the point at which they stopped: counters and timers will not reset in this case. If the data source is the COMSTATE II tape or RAM, no data will have been lost (because the tape was stopped); if the source is LINE, all input signals received during the time the COMSTATE II was in the Halt Mode will have been ignored.

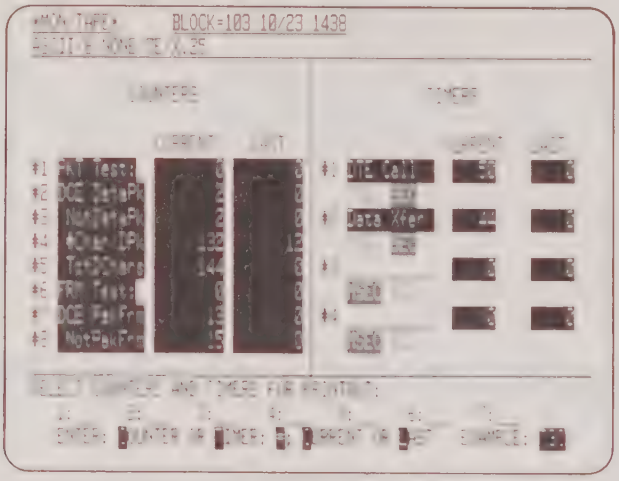


Figure 9-1

(d) Maintain. A special Program menu selection allows you to use the RUN key in yet a fourth way. When you select MAINTAIN on the Parameter 4 menu, the RUN key will initialize the COMSTATE II program, but will not change key program parameters such as the trigger flags and transmit counters. This enables you to run several different COMSTATE II tests, without going through the often complex process of reestablishing a logical session with the computer or terminal being tested. The use of the MAINTAIN selection is explained in Section 40.4.

CAUTION: Always press the PROGRAM key to stop tape motion before you power down the COMSTATE II.

9.2 HALT KEY

HALT suspends all monitor and test activities and freezes the current data on the screen. Counters and timers stop, but do not reset. Capture Memory playback or recording stops, but the tape does not rewind. The timeout timer is stopped. Press RUN to resume program activity after HALT.

9.3 DATA KEY

In Run Mode, this key is used to return data to the screen from a Counter-Timer display. Successively repeating the DATA key alternates the display between 64 and 32 characters per line in Freeze Mode.

9.4 TRACE KEY

This key operates in Freeze Mode and is not intended for use in Run Mode. See Section 10 for detailed information.

9.5 COUNTER-TIMER KEY

Use the CNTR-TMR key to view the real-time counter and timer accumulation (see Figure 9-1). Whenever a counter or timer is reset by triggers, the preceding accumulation is displayed in the LAST column next to the CURRENT or real-time value.

The maximum for counts is 99,999,999; the maximum for time is 65,535. When a counter or timer has overflowed, the current value will blink. The current value will also blink when a counter decrements below zero.

Data is still received by the CRT buffer while the Counter-Timer Summary is shown, and the program continues to operate -- as demonstrated by the activity on the Counter-Timer Summary display. Recording also continues.

Use the DATA key to return data to the screen.

9.6 CRT CONTROL KEYS

(a) MANUAL FREEZE Keys. Manual Freeze (CRT MAN FRZ), Manual Unfreeze (CRT MAN UNFRZ), and Continue Trigger (CONT TRIG) keys are described in Section 10.

(b) CRT CLEAR Key. Pressing CRT CLEAR clears the screen and CRT buffer of data. If real-time data is being displayed, the screen and buffer remain clear only momentarily: real-time data flow is automatically resumed.

9.7 CAPTURE MEMORY KEYS

The three Capture Memory keys, MEM MAN START, MEM MAN STOP and MEM CONT TRIG, can be used to control both recording and playback. These keys normally control the tape; if the high-speed memory option is installed in the unit, they can also be used to control RAM.

(a) Data Playback. When tape or RAM has been selected as SOURCE on the Parameter 1 menu, playback may be stopped and started with the MEM MAN STOP and MEM MAN START keys. The block number in the CRT status line will stop incrementing while playback is stopped, and if the source is tape, tape motion will stop. Data will be frozen on the screen (see also Section 10).

(b) Recording. Recording can be started or stopped at any time with the MEM MAN START or MEM MAN STOP key. If recording is under trigger control, these keys override the triggers. When recording stops, the block number on the CRT status line will stop incrementing; and if recording is on tape the tape will stop moving.

The only way to return recording to trigger control is to press the MEM CONT TRIG key.

10
RUN MODE: MANUAL FREEZE

FREEZE, whether under manual or trigger control, means that no new data is being added to the CRT display or buffer. Data already received is "frozen" on the screen and in the buffer. The CRT Freeze indicator on the status panel is ON.

10.1 CRT MANUAL UNFREEZE KEY

When the display has been frozen, either manually or by triggers, the CRT MAN UNFRZ key will restore data flow to the CRT. The triggers cannot refreeze the display while it is under manual control.

10.2 CRT MANUAL FREEZE KEY

When the display is frozen with the MAN FRZ key, triggers cannot unfreeze it. A number of useful special features are available while the CRT is manually frozen (see Sections 10.6 through 10.9).

10.3 CRT CONTINUE TRIGGER KEY

Trigger control of CRT Freeze is the default condition. The CRT MAN FRZ and CRT MAN UNFRZ keys both override trigger control of the CRT. You may manually freeze and unfreeze the display as often as you wish. Trigger control can be restored only by pressing CRT CONT TRIGGER.

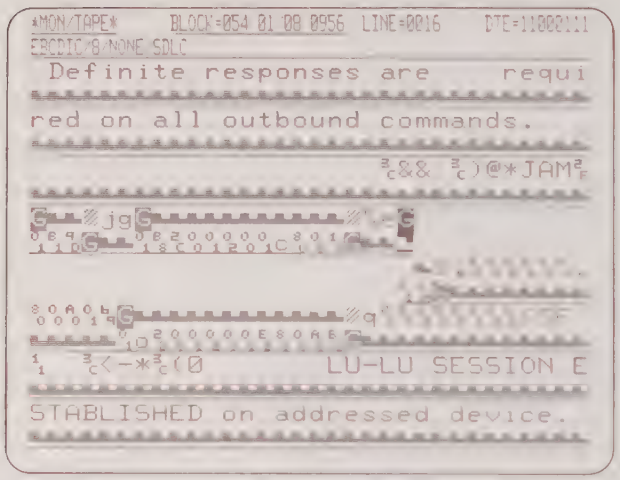


Figure 10-1

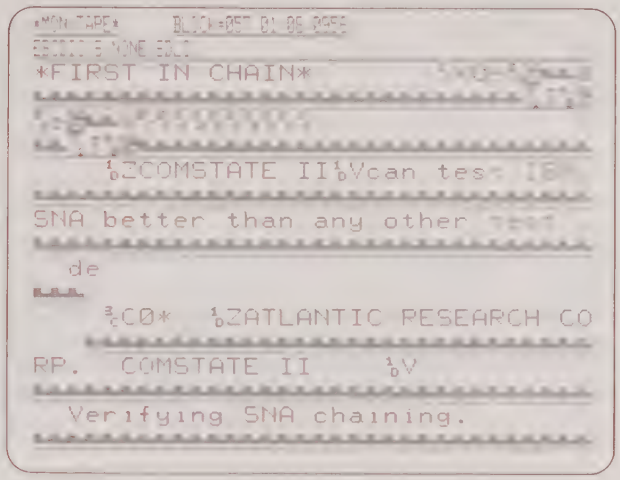


Figure 10-2

10.4 STATUS INDICATORS

The CRT status LEDs on the front panel always indicate whether the display is frozen and whether it is under manual or program (trigger) control (see Section 5.2).

10.5 PROGRAM ACTIVITY

When the display is frozen, whether manually or under trigger control, data reception (for analysis), counting, and timing continue as programmed or manually commanded, and real-time Results can be viewed just as during real-time data display.

10.6 IDENTIFYING THE MANUAL FREEZE DISPLAY

In MANUAL FREEZE, two blank lines on the screen separate new data from old. A character bit pattern is displayed at the upper right. The LINE number shown is the buffer line number, for 32-character lines, of the first line of data currently displayed. Notice the difference between the Manual Freeze display (Figure 10-1) and that seen in Trigger Freeze or Halt Mode (Figure 10-2).

10.7 CAPTURE MEMORY BLOCK DISPLAY

If the data source is TAPE or RAM, the block number is displayed on Line 1 of the screen but does not increment when the CRT is frozen manually, indicating that playback has stopped. If the unit was recording, recording continues and the tape or RAM block number on Line 1 continues to increment.

10.8 CURSOR CONTROL

In addition to the fact that there are two blank lines between old and new data, the cursor will be at the latest character of the new data when the display is manually frozen. From this initial position the cursor can only be moved up or to the left. Moving the cursor continuously to the left until it reaches the beginning of the first line of new data on the display will cause the old data to disappear from the display. At this point, the cursor can once again be moved either to the right or to the left. The old data remains in the CRT buffer and can still be viewed by continued backward scrolling.

While the CRT is frozen, you can see all of the 32k-byte CRT buffer contents. If 64 characters/line has been selected on the Parameter 2 menu, the buffer will contain 32 pages; if 32 characters per line has been selected, the buffer will contain 64 pages. To display the beginning of the buffer, press the B key. The E key will display the end of the buffer. Intermediate positioning of the CRT window can be accomplished with the up or down cursor arrow. When the cursor reaches the top or bottom of the window, it pulls the next line of data onto the screen. To scroll through the entire buffer page by page, press CTRL plus the DOWN ARROW (to move forwards) or CTRL plus the UP ARROW (to move backwards). The LINE number at the top of the display is for 32-character buffer lines so, for example, if you scroll one line in a 64-character dual-line display, the LINE number will change by 4.

The right (or left) cursor arrow moves the cursor right (or left) until it "wraps around" to the beginning (or end) of the next (or preceding) line.

10.9 BINARY CHARACTER BREAKDOWN

At the right end of the top line (or top two lines in the case of dual-line display), the character (or characters) at the cursor location is broken down into its binary pattern and its source identified as DCE or DTE (Figures 10-3 and 10-1). You can obtain this binary breakdown of any character on the screen by positioning the cursor on the character.

NOTE: The rightmost bit is the first serial bit received.

10.10 OTHER RUN MODE KEYS

HEX or CTRL-HEX can be used just as in real-time monitoring. In Freeze Mode, HEX will display all data in hexadecimal. CTRL-HEX will display all, and only, control characters in the selected code font in hexadecimal. To restore the text, simply press HEX or CTRL-HEX again.

Repeated operation of the DATA key alternately displays 64 and 32 characters per line in Freeze Mode. The DATA key is also used to restore the data display when CNTR/TMR has been operated. When X.25 FRAME or PACKET TRACE, SDLC TRACE, or SNA TRACE has been selected on the Parameter 2 menu, data may be displayed by operating the DATA key in Freeze Mode.

The TRACE key is intended for use with bit-oriented protocols. In Freeze Mode it will alternately display levels 2 and 3 for HDLC/X.25 or for SDLC-SNA. To display X.25 (HDLC) Frame Trace or SDLC (Frame) Trace mnemonics, press TRACE. To display X.25 Packet or SNA Trace mnemonics, press TRACE again.

To display counters and timers in Run Mode or Freeze Mode, depress the CTR-TMR key. The counters and timers will continue to operate in Freeze Mode, since the unit continues to send, receive, and test data as programmed.

Capture Memory keys (MEM MAN START, MEM MAN STOP, MEM CONT TRIG) will also operate in Freeze Mode. To return the tape or RAM to trigger control, press MEM CONT TRIG.

Some special key functions are available in Freeze Mode for bit-oriented protocols. These are discussed in Section 47.

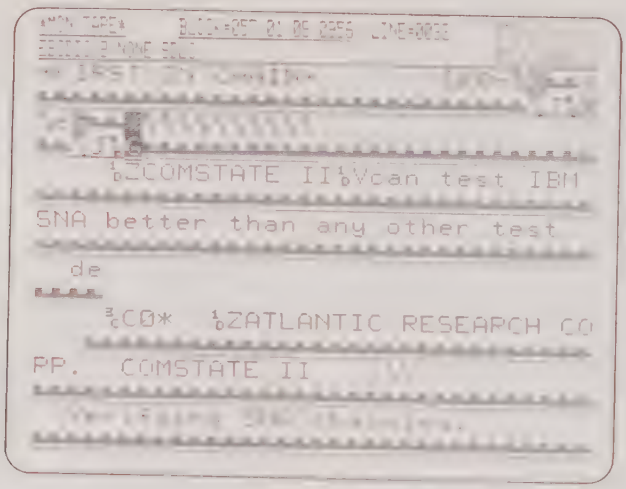


Figure 10-3

11
RUN MODE:
PLAYING BACK CRT DATA

CRT data is constantly captured in a temporary 64 kilobyte buffer as the COMSTATE II displays data in Run mode. After you press the PROGRAM key to call an end to a monitor test or an interactive test, the data buffer does not empty until the next time RUN is depressed. This makes it possible for you to exit Run mode at any time, record the contents of the CRT buffer on tape, and then play back the last 1024 lines of data which were displayed. (CRT data can also be transferred from INTERVIEW to INTERVIEW for later reanalysis as described in Section 50.)

11.1 MONITOR AND REANALYZE MODES

When it is played back, the entire CRT buffer from beginning to end can be routed one byte at a time to simulated (software) receivers that monitor or reanalyze its contents.

(a) Monitoring CRT Data. If the data is monitored (but not reanalyzed), it is displayed with original enhancements, but triggers cannot be used. To monitor CRT data from tape, set up the COMSTATE II as follows:

(1) On the Parameter 1 screen, select MODE: MON, SOURCE: TAPE/CRT, and REANALYZE: NO (see Figure 11-1). Indicate the block number from which you wish playback to start, and make the other selections needed for the type of code to be displayed. Enter the desired speed.

(2) On the Parameter 2 menu, select the DISPLAY MODE you prefer. (SINGLE, DUAL, X.25 FRAME TRACE, X.25 PACKET TRACE, SDLC TRACE or SNA TRACE can be used if you are monitoring CRT data.) Indicate the size of line to be displayed, and enter any characters to be suppressed or enhanced.

(3) Press RUN to play back the data. CRT playback (or reanalysis) will continue until the operator intervenes, the last CRT block saved on tape has been processed, or "non-CRT" data is encountered on the tape.

(b) Reanalyze Mode. When CRT data is reanalyzed, enhancements that were activated by triggers or by the ENHANCE field (Parameter 2 menu) during data capture are stripped off. In this respect, data in Reanalyze mode has a different appearance from captured CRT data that is displayed when MONITOR: TAPE/CRT and REANALYZE: NO are selected. This stripping allows you to change enhancements and in general to

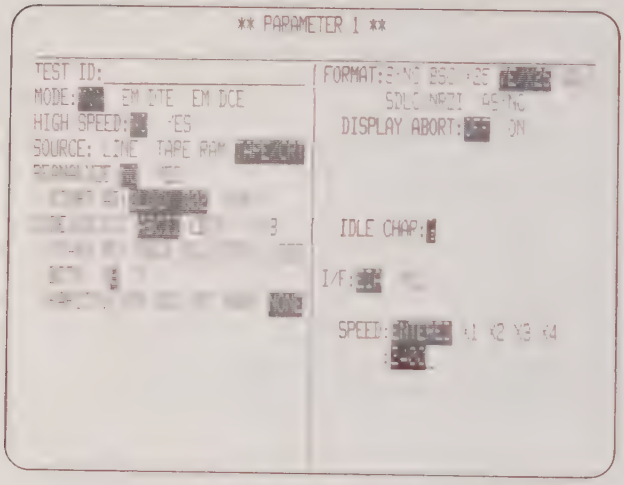


Figure 11-1

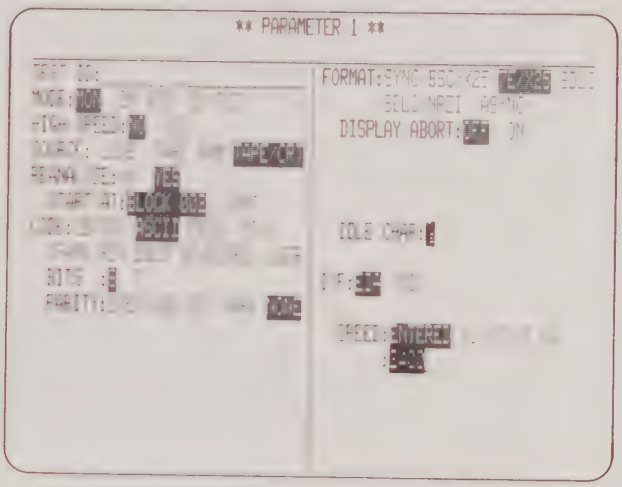


Figure 11-2

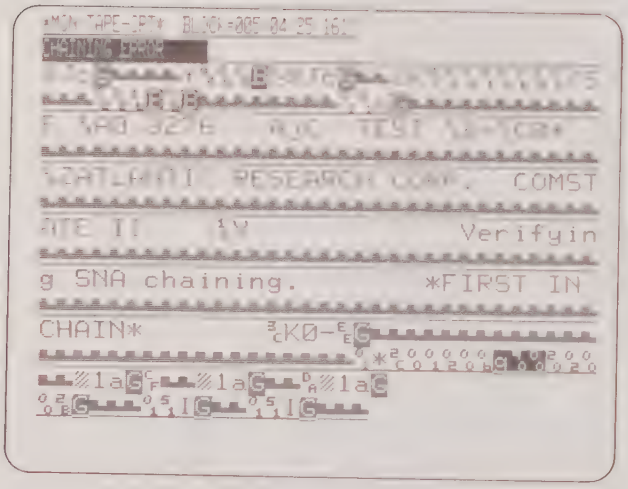


Figure 11-3

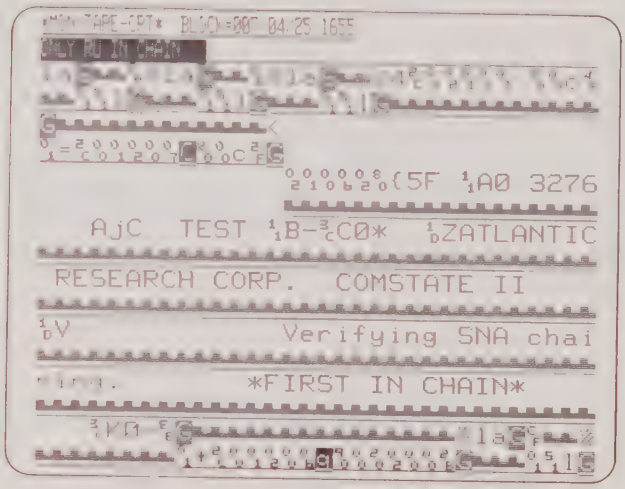


Figure 11-4

start with fresh data every time you press the RUN key. (Automatic enhancements, such as block check symbols, 7E flags, and various X.21 idle characters, or enhanced data resembling these symbols are not stripped.) In addition, when REANALYZE: YES is selected, triggers can be used.

Set up the COMSTATE II to reanalyze CRT data as you would to monitor CRT data, but select REANALYZE: YES on the Parameter 1 screen (see Figure 11-2). Any DISPLAY MODE may be selected on the Parameter 2 screen when CRT data is being reanalyzed.

11.2 DISPLAY CONTROL

The display controls described in Sections 8 through 10 and 18 are available when CRT data is being played back. For example, you may use the CRT MAN FRZ key to freeze the display and the CRT MAN UNFRZ key to resume playback. While the display is frozen, you may use the B key to move to the beginning of the buffer, the E key to move to the end of the buffer, and the arrow keys to move through the buffer. F and P keys provide Frame and Packet expansions.

11.3 CRT DATA VERSUS LINE DATA

Captured data is similar to line data in that it is displayed sequentially. In Reanalyze mode, the data can also activate trigger-menu actions such as enhancements, counters, and state changes and thus drive test programs. Data in this form differs from line data in several important respects, however.

- Real-time intervals between bytes are not maintained. The data buffer channels its contents to the simulated receivers one byte at a time in a steady stream. Press UP or DOWN arrow to alter the speed of this data stream; or change the clock-speed selection on the Parameter 1 menu.

- EIA leads are not captured; so EIA-lead trigger conditions cannot be used.

- Suppressed data is not preserved. Characters that are not displayed are lost. If you are using standard BISYNC and you select IDLE DISPLAY: OFF on the Protocol Setup screen, the idle pad-characters are not stored in the data buffer. If you are working in a bit-oriented protocol and choose to suppress 7E flags (SUPPRESS field, Parameter 2 menu), these flags will not be captured and they will not be available for triggering. (Many string-search conditions in BOP begin "7E flag, not-equal 7E flag," etc.)

- CRT data receivers read bytes, not bits. They are always in sync. This means that when synchronous data is reanalyzed, all sync characters in the data buffer are displayed, and none are deleted. CUTSYNC and AUTO SYNC menu fields are not applicable.

11.4 APPLICATIONS

Playback of CRT data is useful when you need to review data which has been received and displayed but not recorded.

Figures 11-3 and 11-4 demonstrate a typical use of the Reanalyze mode. In Figure 11-3, the unit is in Monitor mode, attached to an SNA data-line, when the triggers detect a sense code that indicates a chaining error. In Figure 11-4, the operator is reanalyzing the data that preceded the chaining error. A new program has been entered. The Request-Header byte that contains the chaining-indicator bits is enhanced; and prompts appear at the top of the display to trace the chaining sequence.

PROGRAMMING NOTE: If 7E flags are suppressed in programs designed for bit-oriented protocols, they are left out of the data buffer and therefore not available for triggering. While automatic frame and packet selections are still valid trigger conditions, certain tests may require that the COMSTATE II LOOK FOR a particular STRING within a frame. Here is a technique for finding the start of a frame when there are no 7E flags. (The technique also works when 7E flags are present.) In this example, the test enhances the ninth byte in a DTE frame.

Trigger 1: Monitor DTE for GDBCC; set internal flags to 00000000.

Trigger 2: Monitor DTE for 1OF NOT EQUAL 7E-FLAG; increment internal flags.

Trigger 3: Monitor DTE for 1OF DON'T CARE, monitor internal flags for 00001000; set CRT REV 1.

Trigger 4: Monitor DTE for 1OF DON'T CARE, monitor internal flags for 00001001; set CRT REV 0.

Another typical use of the Reanalyze mode is to slow down high-speed data. The COMSTATE II is rated for data capture and real-time display at 72 kilobits per second, and for 128 single-trigger states at 64 kilobits per second. However, when HIGH-SPEED mode (Parameter 1 menu) is used to receive data at speeds above 19.2 kilobits per second, only Test A is operative; furthermore, a complex program with numerous simultaneous triggers may not run at the highest speeds. With this special test mode, you can capture 64 pages of high-speed data, load a complex program, and then reanalyze it.

12 MAKING PROGRAM SELECTIONS

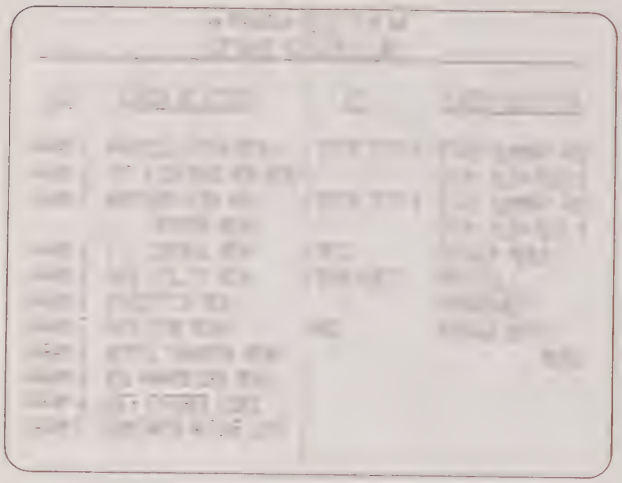


Figure 12-1

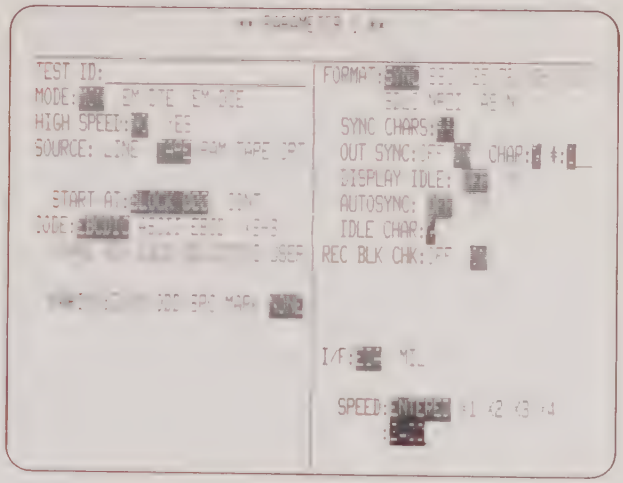


Figure 12-2

12
MAKING PROGRAM SELECTIONS

The program menus in your COMSTATE II are all listed on the Program Selection screen (Figure 12-1), which will be displayed whenever you press the PROGRAM key. To display any of the PARAMETER menus (first column on the Program Selection display), press the PARAMeter key followed by the number given. Use the STATE TEST, TRIG and MSG keys to gain access to the other menus, as indicated in the second column of the selection screen.

The COMSTATE II's program menus show you only pertinent selections. As you make your selections, some additional relevant selections may appear; other irrelevant choices will be eliminated.

The various program menus offer two categories of programming fields: selection fields and data-entry fields. In a selection field, you are offered a choice of entries and the current selection is displayed in low-intensity reverse image. Data-entry fields are displayed in high-intensity reverse image to indicate that you may type in data directly from the keyboard. In Figure 12-2, for instance, the SOURCE line is a selection field, and the BLOCK field is a data-entry field. The START AT line is actually a selection field containing a data-entry field, since you must choose between BLOCK number and CONT before you enter the block number.

Selections are made by positioning the blinking, bright, reverse-image cursor. To move the cursor from one field to the next without changing prior selections, press the ENTER key.

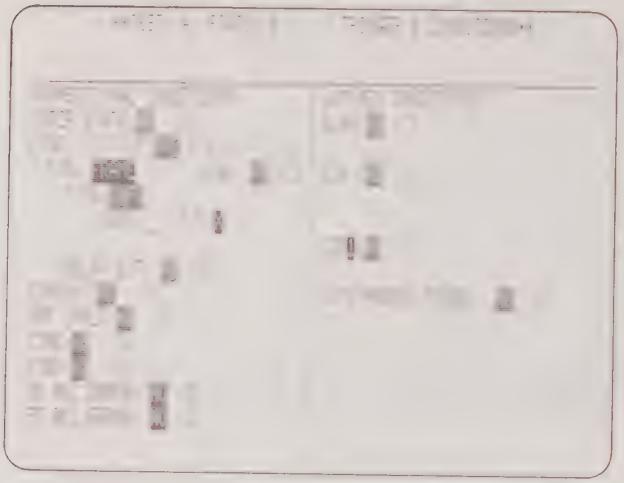


Figure 12-3

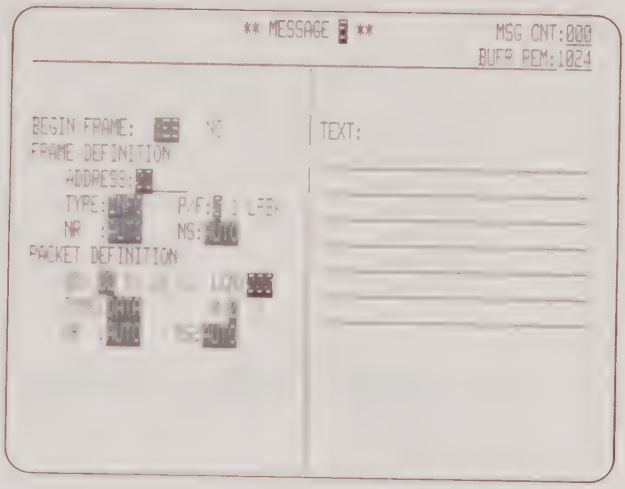


Figure 12-4

The cursor will move directly to the default or current selection in the next field or to the first character position in the case of a data-entry field. To move the cursor within a field, use the RIGHT and LEFT cursor arrows. Once you have made your selection, use ENTER to leave the field. The UP arrow will take you back to the preceding field if you have overshot your mark. See Section 6 for a complete description of cursor operation.

Some selection fields are rotating window fields; for example, the FOR and TYPE fields on the trigger conditions menus (see Figures 12-3 and 12-4) and the TYPE, NR, NS, PR, and PS fields on the message-entry menus (when one of the bit-oriented protocols has been selected on the Parameter 1 menu). To make selections in these fields, press the ROLL key to sequence through the field in one direction, or SHIFT-ROLL (or CTRL-ROLL) to display selections in the reverse order. The ENTER key should always be used to leave these fields once you have made your choice.

To correct a data entry, you may position the cursor on the error and write over it. (Backspacing with the LEFT cursor arrow changes selections but does not alter data entries.) Pressing CLEAR FIELD clears the current data-entry field. SHIFT plus CLEAR FIELD clears a data-entry field starting at the cursor position, and CTRL-CLEAR FIELD clears an entire menu to default condition.

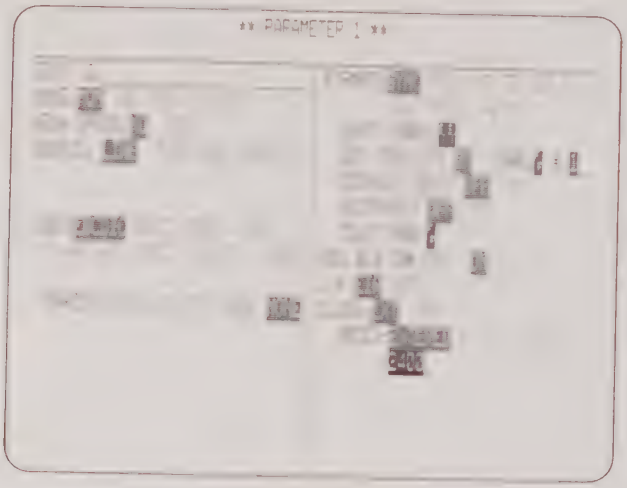


Figure 13-1

13
SELECTING THE COMSTATE II'S OPERATING MODE

To select all the basic parameters necessary to monitor any variety of data or use any of the COMSTATE II's interactive test modes, press the bright blue PROGRAM key to enter Program Mode; then press the PARAM key followed by numeral 1. The display of Figure 13-1 will appear, but it will vary somewhat, depending on what program is already present. Figure 13-1 is the default menu.

13.1 TEST ID

A test identifier of up to 22 characters may be typed onto this line. All alpha, numeric, and control characters are valid in this data-entry field. When a saved program has been loaded from the tape, the ID of that program is shown. If data is to be recorded, it is useful to use this line to identify the system or channel, date, time, and so on, so that this information is saved on the tape along with the program and data.

13.2 MODE

On this line, choose among MONITOR and two interactive EMULATE modes. The following description of each mode assumes that the correct data connection has been made on the rear of the unit.

(a) Monitor. This is the passive mode. In Monitor Mode, the COMSTATE II will receive data and can perform extensive diagnostics on it. The circuit under test will not be interrupted. You may monitor and analyze data from the line or from the COMSTATE II's integral tape -- or from RAM if your unit has the high-speed memory option. In this mode, use the MONITOR data connector.

CAUTION: When either of the following two interactive modes is selected, a data line must be broken to enable testing.

(b) Emulate DTE. Make this selection for interactive testing of the DCE. Break the data line from the DTE and connect the DCE to the TO MODEM, EMULATE DTE connector on the COMSTATE II.

(c) Emulate DCE. This mode is for testing the DTE. Break the data line from the DCE and connect the DTE to the TO TERMINAL, EMULATE DCE connector.

13.3 HIGH-SPEED MODE

This mode is intended for use at line data speeds above 19.2 kbps and up to 64 kbps. Be sure to read Section 44 for information on high-speed operation.

13.4 SOURCE

This selection field determines the source of the data to be monitored or tested.

(a) LINE is the default selection. In Monitor Mode when LINE is selected, the COMSTATE II will monitor data received at one of the line interface connectors on the rear panel.

In Emulate DTE Mode when LINE is selected, the COMSTATE II will transmit on TD and receive on RD. In Emulate DCE Mode, the COMSTATE II will transmit on RD and receive on TD.

(b) TAPE allows data that has been recorded on tape to be played back and displayed. Selecting TAPE brings up the START AT field. The CLOCK selection field (last line of the menu) goes away because the tape always plays back on internal clock.

(c) RAM appears as a choice on the SOURCE line only if the high-speed Random Access Memory option has been installed in the unit. When you select RAM, the data content of the RAM will be played back. The START AT field is displayed -- see (b) above -- and the CLOCK field goes away.

(d) TAPE/CRT allows you to play back screen buffer data which has previously been saved on tape.

Select MODE: MON and SOURCE: CRT/DATA to monitor this character-oriented data. Select MODE: MON, SOURCE: CRT/DATA, and REANALYZE: YES to reanalyze the data.

Capture of CRT data is explained in Section 34.

(e) Playback in Emulate Modes. If EM DTE is selected and the SOURCE is TAPE or RAM, then the Capture Memory will play back on the RD lead and the COMSTATE II's transmitter, which is controlled by triggers, will transmit on TD. If EM DCE is selected and the SOURCE is TAPE or RAM, then the Capture Memory will play back on the TD lead and the COMSTATE II will transmit on RD.

13.5 REANALYZE

If the source of data is TAPE/CRT, the selection REANALYZE appears on the line below (see Figure 13-2). Select REANALYZE : YES to strip previous enhancements from data and to allow trigger analysis of the data.

Reanalysis of CRT data is explained in Section 11.

13.6 START AT

This selection field only appears if the SOURCE selected is TAPE, TAPE/CRT, or RAM (see Figure 13-3). It determines the block of tape or RAM at which the COMSTATE II will begin to play back data.

NOTE: See Sections 32 and 33 for a thorough discussion of tape operation and block numbering.

If BLOCK 000 is selected, the tape will rewind when RUN is pressed and start to play from the first block recorded on the tape. This is the default selection. The number of any other block may be entered as the starting point. There are about 250 blocks on a tape; 54 blocks in 1-Megabit RAM, and 218 blocks in 4-Megabit RAM.

CONTinue allows playback to resume from the block that was being played before leaving Run Mode. For example, if during playback at Block 015 you want to change a program menu, press the PROGRAM key, make the desired changes, and select CONT. When you return to Run Mode, playback will automatically continue from Block 015.

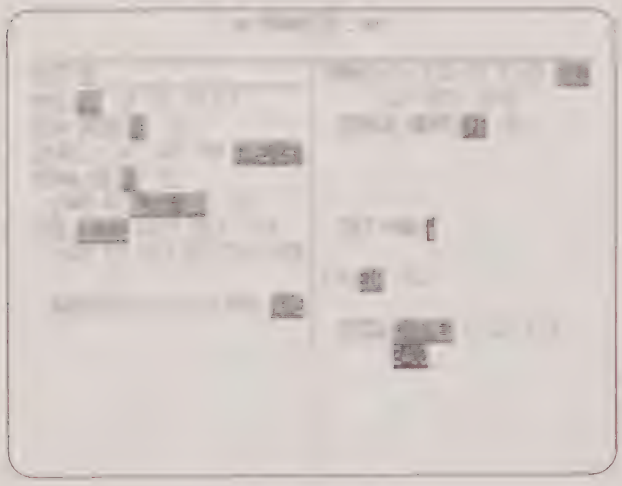


Figure 13-2

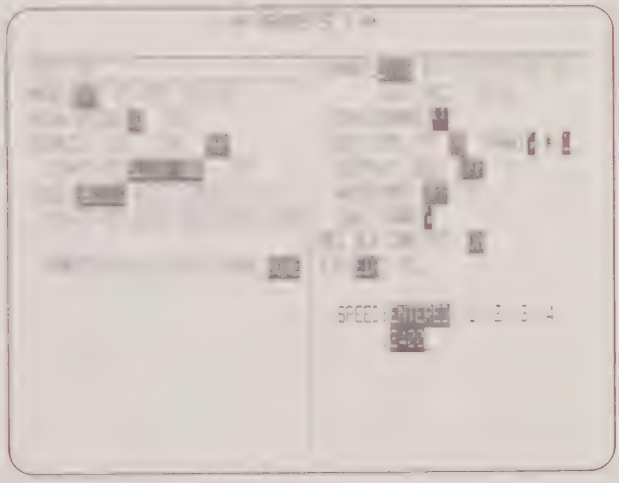


Figure 13-3

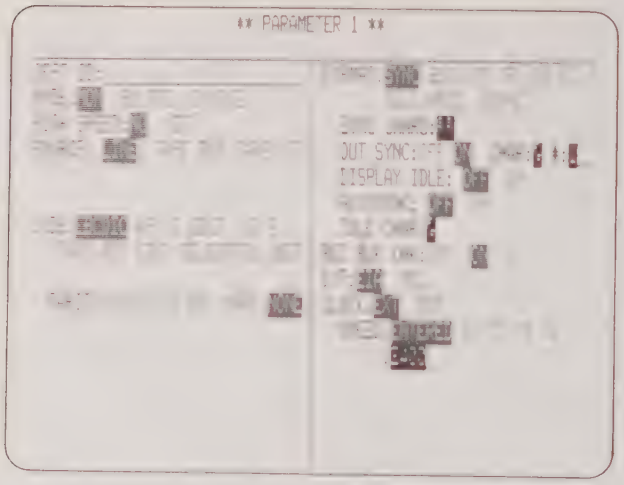


Figure 14-1

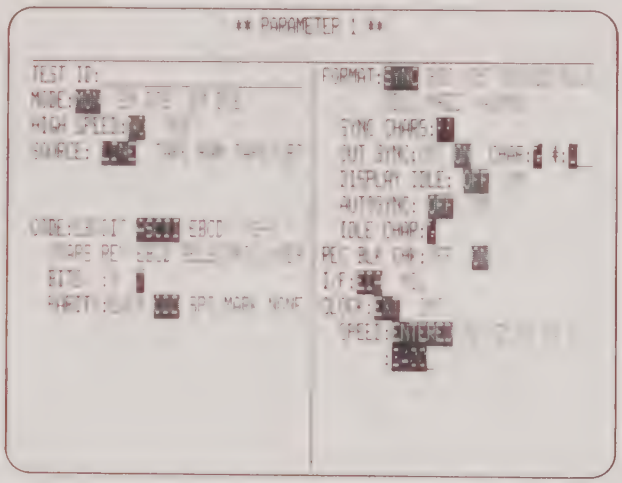


Figure 14-2

14
CODE SELECTION

The data code is selected on the Parameter 1 menu. Your Code selections determine which of several other selections will be displayed.

14.1 STANDARD CODES

The standard COMSTATE II gives you a choice of seven codes, namely, EBCDIC, ASCII, EBCD, XS-3, IPARS, REVerse EBCD, and SELECTRIC, as well as USER (see Figure 14-1). The default code is EBCDIC. In the remaining fields, you will only be shown choices allowed for your CODE selection. Your code choice also determines the default selections for some of the remaining parameters. Table 14-1 gives details of the synchronization character translations that result from each code choice. The code selection also helps determine the default CRC calculation (see Section 16).

14.2 BITS

The BITS field appears for codes having more than one possible number of information bits (Figure 14-2). Only the number of information bits is selected here: the parity bit is not included. For the default CODE (EBCDIC), no selection is available and this field is not visible. For ASCII, the choices are 8 and 7 bits. The choices allowed and the default values for each code are included in Table 14-1.

TABLE 14-1
PARAMETERS RESULTING FROM CODE SELECTIONS

	Default			Other Choices	
Code	Info. Bits	Parity	SY1 SY2 (hex)	Info. Bits	Parity
EBCDIC	8	None	32 32	--	Even, Odd (Note 1)
ASCII	7	Odd	16 16 (Note 2)	8	Even, Odd (Note 1)
				7	Even, Mark, Space, None
EBCD	(6)	Odd	3D 3D (Note 3)	--	Even, Mark, Space, None
XS-3	(6)	Odd	35 35	--	----------
IPARS	(6)	(None)	3F 3E	--	----------
Rev. EBCD	(6)	Odd	1A 1A	--	Even, Mark, Space, None
Selectric	(6)	Odd	--	--	Even, Mark, Space, None

Note 1. Mark and Space are not valid selections for 8-bit codes plus parity. Eight bits plus parity is valid only for Synchronous and Asynchronous formats.

Note 2. Also applies to space parity and 8-bit ASCII. For even or mark parity ASCII, SY SY defaults to 96 96 (hex).

Note 3. Also applies to space parity EBCD. For even or mark parity EBCD, SY SY defaults to 7D 7D (hex).

Note 4. While HEX is selected, if 5, 6, or 8 is selected for Info. Bits, Parity will remain NONE until the Code selection is altered.

14.3 PARITY

When you select a code that uses PARITY, this selection field (Figure 14-2) allows you to choose parity. The parity bit is additional to the data information bits. The parity bit can be tested and counted (Section 20.4) and parity errors can be enhanced (Section 18.4).

Notice that MARK or SPaCe may be selected as the parity bit condition. Violations will then be considered as parity errors.

The COMSTATE II can monitor and transmit 8-bit codes plus parity. You may select either odd or even parity -- mark and space are invalid in this case. Eight bits plus parity is permitted only in Synchronous or Asynchronous format (Section 15.1). When a bit-oriented format is selected (BSC/X.25, 7E/X.25, SDLC, or SDLC/NRZI), eight bits plus parity is invalid.

NOTE: When 8 bits plus parity is selected, the Parameter 2 Enhance Parity selection and the trigger condition which monitors parity errors (LINE: FOR: PARER) cannot be used.

14.4 USER CODES

The User Code feature allows you to enter any code set into the COMSTATE II memory, whether it is a special code, a slight modification of a standard code, or a code you have invented. You define a code set by entering keyboard characters on a conversion chart on the lower portion of the Parameter A menu. You may select an unshifted code set, hex 00 to FF (Figure 14-3), or a shifted code, with two sets of hex 00 to 7F (Figure 14-4).

If you power up the COMSTATE II and press PROGRAM, PARAM, A, you will see the default equivalency chart for EBCDIC (Figure 14-3). If you make a CODE selection on the Parameter 1 screen and then press PARAMETER, A, the equivalency for the code just selected appears. If USER is your initial code selection on Parameter 1, the chart will be blank when you display the Parameter A screen. To clear the conversion chart, press CTRL-CLEAR with the cursor in the conversion area.

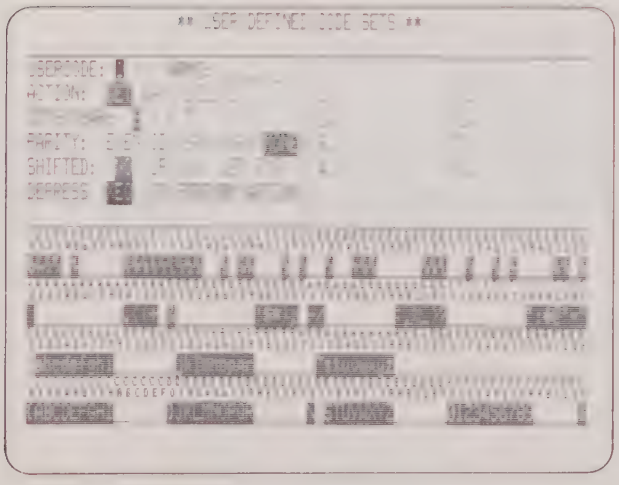


Figure 14-3

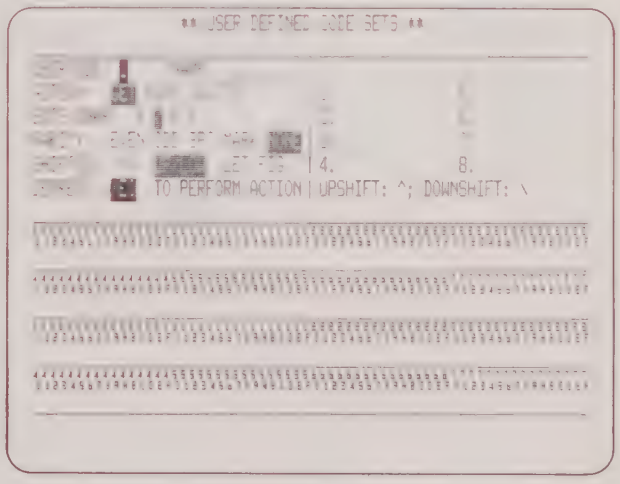


Figure 14-4

To enter a code on the Parameter A screen, make selections for BITS/CHARacter, PARITY, and SHIFTED. Move the cursor down to the equivalency-chart field. In this field, the ENTER key moves the cursor to the first position on the next line. The CURSOR ARROWS move the cursor one line or one character at a time, while CTRL-LEFT or CTRL-RIGHT moves the cursor to the beginning or end of a line. Enter any light-grey keyboard character, including control characters, anywhere on the equivalency chart consistent with the bits/character count. (That is, a 6-bit code, for example, cannot encode or decode beyond 3F on the conversion chart.)

To modify a standard code set, first go to the Parameter 1 screen and select that code. Then make your modifications on the conversion chart in Parameter A, which now shows the standard code you have selected. Your first entry in the conversion-chart field in Parameter A will change the Parameter 1 current CODE selection to USER. See Figure 14-5. The new or revised code set displayed in the code chart is the code which is used when RUN is depressed. There is no requirement to save a code.

> NOTE: If you try to transmit a keyboard character that is not entered on the conversion chart, the unit will transmit hex 00 (NULL) for that character.

The COMSTATE II will store 8 user codes in nonvolatile memory. To save a code set, enter a storage-slot number (1-8) in the field for USERCODE, and give the code a NAME. Select ACTION: SAVE, and press XEQ. See Figure 14-6. You may GET and DELETE code sets in a similar manner.

The DELETE command has a safety feature. If a code set is inadvertently deleted, the code set can still be retrieved by selecting the deleted storage slot and performing ACTION: GET. DELETE removes the name of a code set from the storage file, but only a SAVE command to the same slot will delete the code set, by overwriting it.

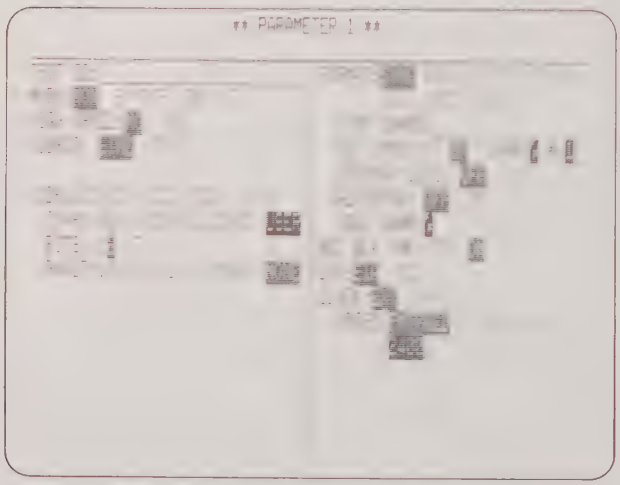


Figure 14-5

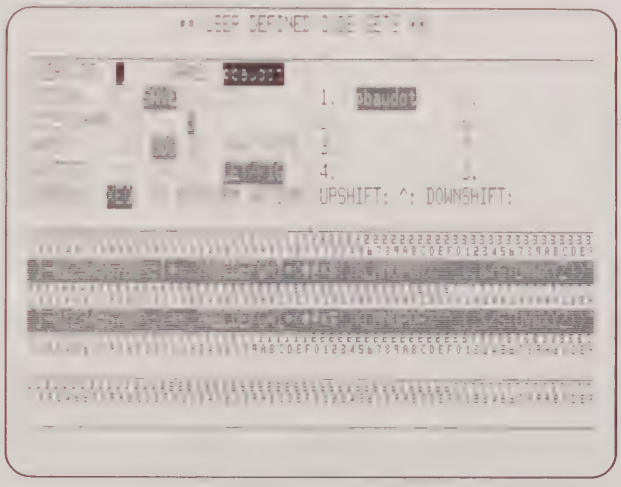


Figure 14-6

15
FORMAT SELECTION

15.1 FORMATS

Essentially, the FORMAT selections (Figures 15-1 to 15-4) program the COMSTATE II correctly for your protocol, and determine what choices are allowed in the following fields. To simplify programming, you are not shown unnecessary choices that could result in an "illegal" setup or could mislead you.

(a) SYNC. SYNChronous operation is the default FORMAT selection (Figure 15-1). You may accept the standard synchronization pattern in the next field, or enter any nonstandard characters you wish. SYNC also permits you to choose OUT SYNC and AUTOSYNC.

(b) BSC/X.25. Choose BSC/X.25 for BISYNC-framed X.25 (Figure 15-2). You may change the SYNC CHARS if necessary. AUTOSYNC and OUT SYNC will be available. For BSC/X.25, the string search capabilities of the unit are enhanced to ignore inserted DLE and DLE SYN (see Section 46.2).

(c) 7E/X.25. 7E/X.25 selects Bit-Oriented Protocols with HDLC framing (that is, 7E (hex) Flags, zero bit insertion) and data packet transmission, such as X.25 and BDLC. In these protocols, the synchronization Flag pattern and the conditions for OUT SYNC are always defined, so these selection fields will not appear (Figure 15-3).

(d) SDLC and SDLC/NRZI. SDLC selects IBM's SDLC-SNA; SDLC/NRZI picks SDLC with NonReturn-to-Zero encoding. As in 7E/X.25, synchronization is defined by the protocol so no other format lines are presented (Figure 15-4).

(e) ASYNC. For ASYNC, or asynchronous start-stop data, a STOP BITS selection field is displayed on the following line. The selections are 1, 1.5, and 2 (the default selection). ASYNC requires no other selections than the source of clock; default is INTernal (Figure 15-5). With EXTernal clock selected, ASYNC operation is isochronous.

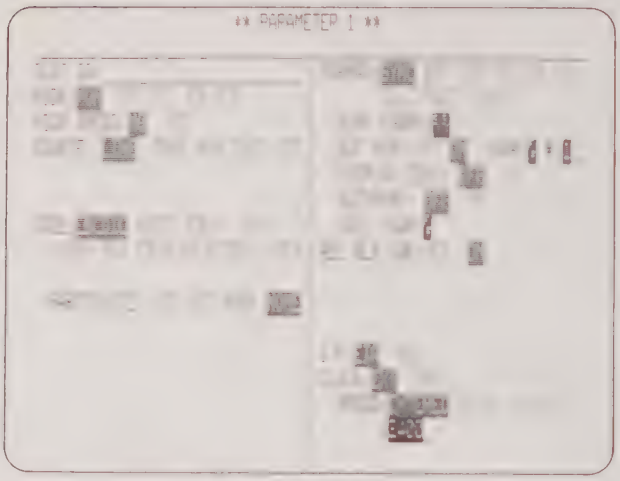


Figure 15-1

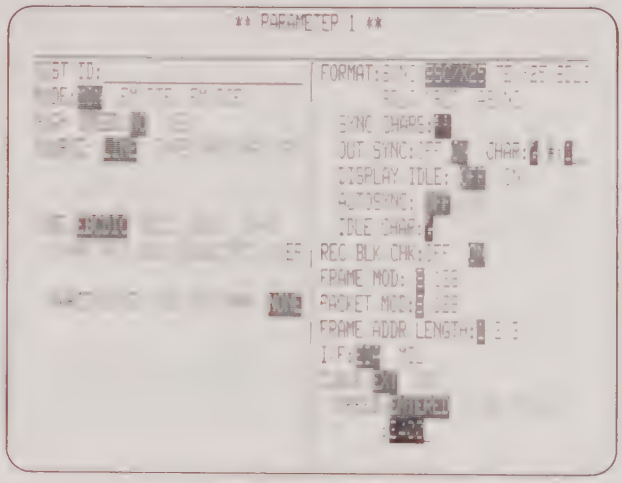


Figure 15-2

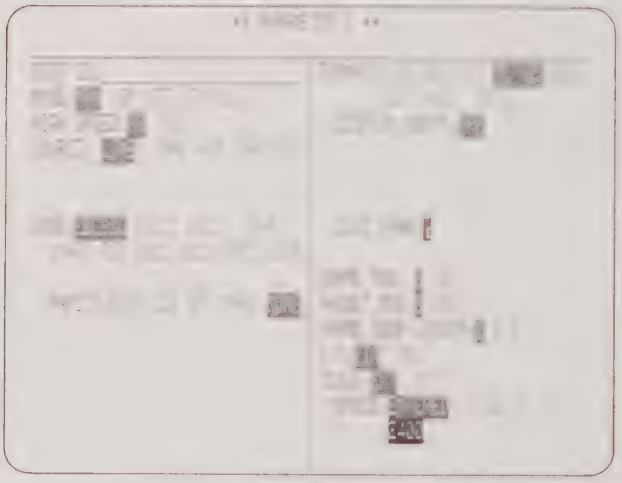


Figure 15-3

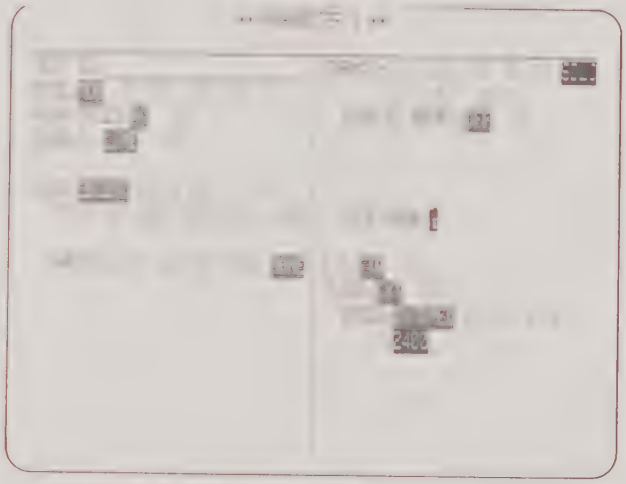


Figure 15-4

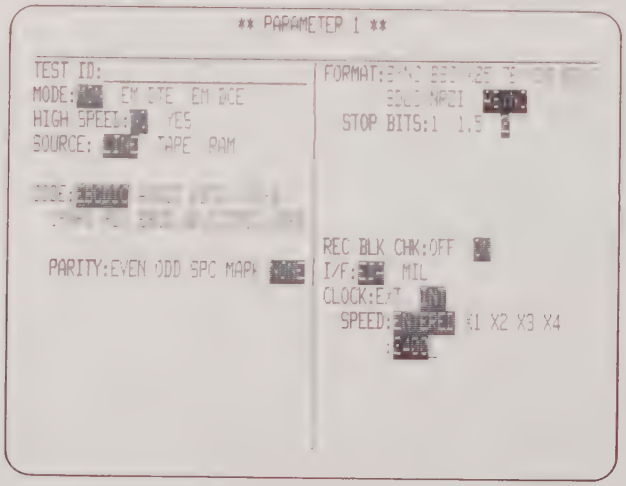


Figure 15-5

15.2 SYNCHRONIZATION CHARACTERS

The SYNC CHARS data-entry field (see Figures 15-1 and 15-2) determines the synchronization pattern for synchronous data formats. The synchronization characters default to SY SY. In Run Mode, the code chart lookup is automatically performed: the proper SY character for the selected code is transmitted and (or) displayed in hexadecimal. The code chart lookup also obeys the parity selection; for example, the synchronization pattern in odd-parity ASCII is 16 16 (hex) but for even-parity ASCII it is automatically converted to 96 96 (hex). (See Table 14-1 for the default values of SY.)

Any other one- or two-character sequence may be entered, using alphanumeric keys, control characters, or hexadecimal. If the characters are entered in hexadecimal, then the selected code chart and parity selection will be ignored and the hexadecimal value entered will be used.

To select a one-character synchronization pattern, position the cursor on the SYNC CHARS line, depress CLEAR FIELD, and enter the desired character.

In Run Mode, the characters that the COMSTATE II uses to find synchronization will not be displayed. Thus if a two-character synchronization pattern is selected, the first two synchronization characters received will not be displayed.

15.3 OUT SYNC

OUT SYNC ON (see Figure 15-1) causes a receiver to go out of synchronization if it finds the entered character in the data stream. Any character may be entered in the CHAR field. The number field (#) allows you to specify how many times the character must occur consecutively (from one to 255 times) before OUT SYNC occurs. Default condition for OUT SYNC is one FF (hex).

NOTE: A block check character may appear as FF (hex), and in transparent text there is the possibility that a legitimate data FF (hex) will occur. In such cases, it may be necessary to increase the number of OUT SYNC characters or to use a trigger condition to force the COMSTATE II out of synchronization.

15.4 DISPLAY IDLE

OFF (see Figure 15-1) suppresses display of idle characters from the time the receivers go out of synchronization until they see the synchronization pattern again. If you select ON, the idle characters will be displayed.

15.5 AUTOSYNC

AUTOSYNC (see Figure 15-1) allows the COMSTATE II to recognize a synchronization pattern at any time even though the receiver logic may "think" it is already in synchronization. AUTOSYNC should only be used with a two-character synchronization pattern. When AUTOSYNC is enabled, the logic constantly tests for the synchronization pattern on a bit-by-bit basis. When a match is found, it becomes the new reference point for character framing. AUTOSYNC thus eliminates the need to "bit shift" the data to find synchronization.

NOTE: If the COMSTATE II does not go out of synchronization between transmissions, the two synchronization characters at the beginning of the next frame may be displayed as "garbage" characters. Because the number of bits between transmissions may not be an exact multiple of a character, the extra bits may cause the synchronization characters to be skewed and appear as garbage characters.

NOTE: Sometimes the synchronization pattern will appear and be detected within a data block. If this happens while AUTOSYNC is enabled, then the COMSTATE II will resynchronize on this pattern and the rest of the block of data will be shifted. Odd-parity ASCII, for example, has several different character combinations that may appear within a data block and shift the rest of that block. If certain characters, including SYN, 0 (zero), a, B, ENQ, VT, , (comma), and X, are repeated three times within a data block, they are especially likely to cause the unit to resynchronize when AUTOSYNC is enabled.

AUTOSYNC is extremely useful where there is no particular end of message character (OUT SYNC), or where one block of data follows another by less than a full character interval. AUTOSYNC will detect the synchronization pattern even though it is skewed from the previous block, and display the succeeding data correctly.

NOTE: If AUTOSYNC is on, the second synchronization character will not be displayed when the synchronization pattern is found.

15.6 DISPLAY ABORT

When a bit-oriented format is selected (see Figure 15-3), the DISPLAY ABORT field appears. To display aborts which occur between frames, select ON. The default selection is NO. This selection does not pertain to aborted frames, which will be displayed in any case.

15.7 STOP BITS

When ASYNC has been selected in the FORMAT field (see Figure 15-5), you may choose the appropriate number of stop bits (1, 1 1/2, or 2) for the protocol in use.

15.8 IDLE CHARACTER SELECTION

The IDLE CHAR field (see Figure 15-1) is valid for all formats except ASYNC. It allows you to specify what idle line condition will be applied by the COMSTATE II in Emulate modes. Alphanumeric characters, control characters, or hexadecimal characters may be entered in this field.

15.9 FRAME MOD

This selection appears when BSC/X25 or 7E/X25 is selected. It allows you to specify whether the COMSTATE II will transmit and receive frames with modulo 8 sequencing (NR and NS of 0-7) or frames with modulo 128 sequencing (NR and NS of 0-127). FRAME MOD 8 is the default selection.

15.10 PACKET MOD

This selection appears when BSC/X25 or 7E/X25 is selected. Select PACKET MOD 8 (the default) if sequencing of transmitted and received packets is modulo 8 (PR and PS of 0-7). Select PACKET MOD 128 if sequencing of packets is modulo 128 (PR and PS of 0-127).

15.11 FRAME ADDRESS LENGTH

This field appears when BSC/X25 or 7E/X25 is selected as the format. The default length is 1 byte. You may also select a length of 2 bytes or 3 bytes when extended frame addressing is used.

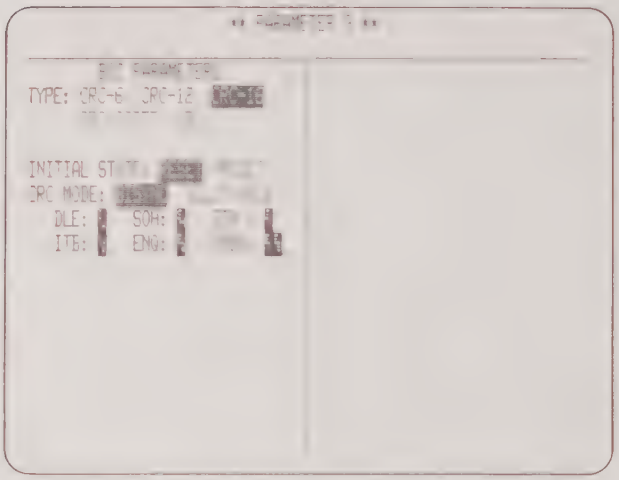


Figure 16-1

Figure 16-2

16
BLOCK CHECK CALCULATIONS

The COMSTATE II performs a variety of standard and nonstandard block check calculations on both received and transmitted data. You can test for unique applications by altering the parameters of the block check calculation on the BCC Parameters menu (Parameter 9; shown in Figure 16-1).

16.1 RECEIVED BLOCK CHECKING

Received block checking is enabled from the Parameter 1 menu, REC BLK CHK: OFF ON (Figure 16-2). Actual control of the block check parameters is achieved from the BCC Parameters menu (Parameter 9).

Table 16-1 summarizes how code and format selections may alter the RECeived BLocK CHecK field on the Parameter 1 menu and the BCC Parameters menu (Parameter 9).

For codes other than HEX or BAUDOT, REC BLK CHK defaults to ON on the Parameter 1 menu. It may be turned OFF. For HEX or BAUDOT, the default is OFF because neither supports block checking.

For BISYNC or ASYNC formats, REC BLK CHK defaults to YES. For bit-oriented protocols (7E/X.25, SDLC, SDLC/NRZI) REC BLK CHK is automatically ON and cannot be modified (the field will not be visible on the Parameter 1 menu when one of these formats has been selected).

TABLE 16-1
COMSTATE II CODE AND FORMAT RECEIVED BLOCK CHECK DEFAULTS

	Parameter 1 REC BLK CHK	Parameter 9 BCC PARAMETERS
CODE		
EBCDIC	Default: ON	Default Parameters (may be modified)
ASCII	Default: ON	Default Parameters (may be modified)
EBCD	Default: ON	Default Parameters (may be modified)
XS-3	Default: ON	Default Parameters (may be modified)
IPARS	Default: ON	Default Parameters (may be modified)
REV EBCD	Default: ON	Default Parameters (may be modified)
SELECTRIC	Default:ON	Default Parameters (may be modified)
HEX	Default: OFF	No Default BCC Control Characters
BAUDOT	Default: OFF	No Default BCC Control Characters
USER	Default: ON	No Default BCC Control Characters
FORMAT		
SYNC	Default: ON	Default Parameters (may be modified)
BSC/X.25	Default: ON	BCC Automatic -- Screen Not Applicable
7E/X.25	ON*	BCC Automatic -- Screen Not Applicable
SDLC	ON*	BCC Automatic -- Screen Not Applicable
SDLC/NRZI	ON*	BCC Automatic -- Screen Not Applicable
ASYNC	Default: ON	Default Parameters (may be modified)

When REC BLK CHK is OFF, the actual block check characters received by the COMSTATE II on both TD and RD are displayed, but no calculations are performed on received data.

When received block checking is ON, the COMSTATE II performs block check calculations on all received data according to the parameters set on the BCC Parameters menu. When a block check is Good, a low-intensity reverse-image G is displayed in place of the last block check character; when a block check is Bad, a full-intensity reverse-image B is displayed.

The COMSTATE II does not display Aborts between frames except for 7E/X.25, SDLC, and SDLC/NRZI. For these formats, it displays a full-intensity, reverse-image A when it detects seven consecutive "1" bits.

16.2 TRANSMITTED BLOCK CHECKING

Transmitted block checks are enabled on the XMIT line of the Trigger Actions menus. If NO is selected, no block check will be transmitted. If a Trigger menu has been set to transmit block check characters, BCC characters will be transmitted in accordance with the parameters in effect on the BCC Parameters menu.

16.3 DEFAULT BLOCK CHECK CALCULATIONS

The COMSTATE II automatically defaults to specific standard block check calculations depending on the code and format selections made on the Parameter 1 menu (see Table 16-1). Table 16-2 summarizes the default BCC settings for the various standard codes and formats supported by the COMSTATE II.

The actual equations used by the COMSTATE II in BCC calculations are defined in Table 16-3.

TABLE 16-2
COMSTATE II DEFAULT BLOCK CHECK CALCULATIONS

Code	Format	Is Param 9 Screen Appl.?	BCC Type	BCC Starts	BCC Resets on (Note 7)	Ignores (Strips from Calculations)	BCC Ends with	Aborts (No BCC)
EBCDIC	SYNC	YES	CRC-16					
	ASYNC	YES	CRC-16		Defaults to BISYNC CRC Mode Operation			
	BSC/X.25	NO	---		See Section 16.5 on BISYNC CRC Mode Operation			
	BOPs (Note 1)	NO	---					
ASCII	SYNC	YES	LRC					
	ASYNC	YES	LRC		Defaults to BISYNC CRC Mode Operation			
	BSC/X.25	NO	---		See Section 16.5 on BISYNC CRC Mode Operation			
	BOPs (Note 1)	NO	---					
Transmit:	SYNC	YES	LRC		EOT (resets LRC)	# (at start of message)	ETB	EOT
EBCD	ASYNC	YES	LRC	First text	EBCD (3CH)	EBCD (34H)	EBCD (1EH)	EBCD (3CH)
REV EBCD	BSC/X.25	NO	---	character	R-EBCD(ØFH)	R-EBCD(ØBH)	R-EBCD(1EH)	R-EBCD(ØFH)
SELECTRIC	BOPs (Note 1)	NO	---		SEL (3CH)	SEL (3ØH)	SEL (1EH)	SEL (3CH)
(Note 2)								
Receive:	SYNC	YES	LRC		EOT		ETB	EOT
EBCD	ASYNC	YES	LRC	First text	EBCD (3CH)		EBCD (1EH)	EBCD (3CH)
REV EBCD	BSC/X.25	NO	---	character	R-EBCD(ØFH)	---	R-EBCD(1EH)	R-EBCD(ØFH)
SELECTRIC	BOPs (Note 1)	NO	---	(Note 4)	SEL (3CH)		SEL (1EH)	SEL (3CH)
(Note 3)								(Note 5)
XS-3	SYNC	YES	LRC				EOM	
	ASYNC	YES	LRC	SOM			(55H)	
	BSC/X.25	NO	---	(4ØH)	---	---	(not inclu-	---
	BOPs (Note 1)	NO	---	(not			ded in BCC)	
				included				
				in BCC)				
IPARS	SYNC	YES	CRC-6	First bit			EOM-PB(3DH)	
	ASYNC	YES	CRC-6	after	Next bit		EOM-1 (ØDH)	SY1
	BSC/X.25	NO	---	SY1 SY2	after CRC	---	EOM-C (1DH)	(3FH)
	BOPs (Note 1)	NO	---	(3FH 3EH)			EOM-U (2DH)	

(continued)

TABLE 16-2 (continued)

Code	Format	Is Param 9 Screen Appl.?	Type	BCC Starts	BCC Resets on (Note 7)	Ignores (Strips from Calculations)	BCC Ends with	Aborts (No BCC)
USER	SYNC	YES		NO DEFAULT BCC				
	ASYNC	YES						
	BSC/X.25	NO						
	BOPs (Note 1)	NO						

(Note 8)

Note 1: BOPs = Bit Oriented Protocols, including: 7E/X.25, SDLC, SDLC/NRZI, HDLC
Note 2: Parity bit of LRC = LRC of all parity bits in transmission.
Note 3: LRC ignores parity bits.
Note 4: The bid character (#) at start of first transmission is not included in calculation, but thereafter all bid characters are included until an EOT is found.
Note 5: An EOT on one side of the line resets the other side of the line also.
Note 6: Note: Initial State is Preset (all 1's).
Note 7: Calculations are reset whenever OUTSYNC or AUTOSYNC occurs.
Note 8: Includes Baudot.

TABLE 16-3
BLOCK CHECK POLYNOMIALS

BCC Type	Block Check Polynomial
CRC-16	$X^{16} + X^{15} + X^2 + 1$
CRC-CITT	$X^{16} + X^{12} + X^5 + 1$
CRC-12	$X^{12} + X^{11} + X^3 + X^2 + X + 1$
CRC-6	$X^6 + X^5 + 1$

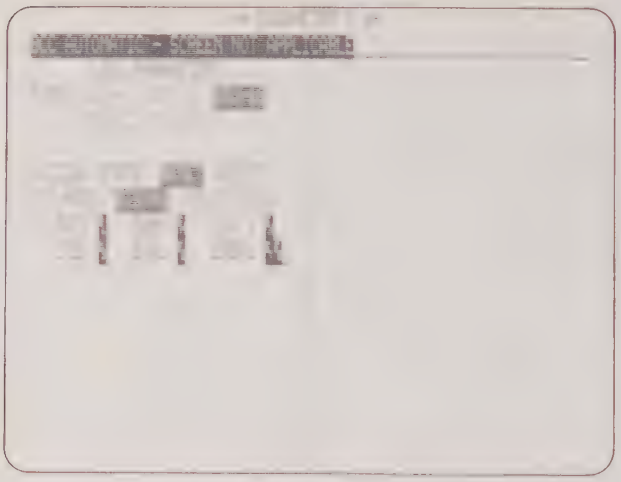


Figure 16-3

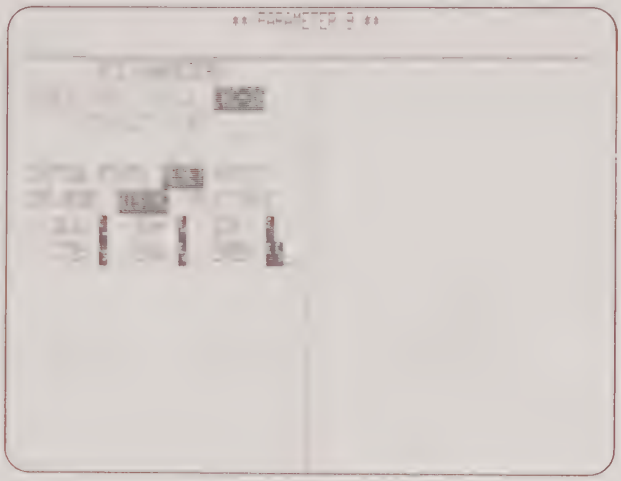


Figure 16-4

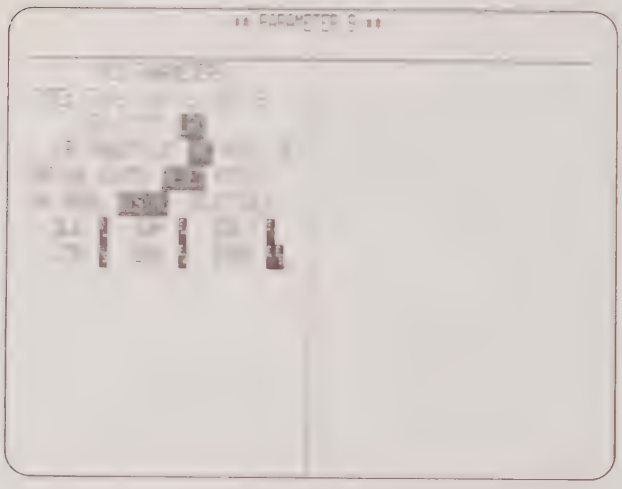


Figure 16-5

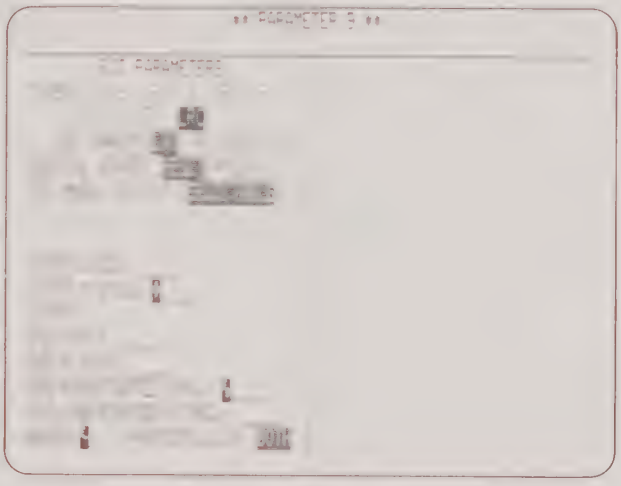


Figure 16-6

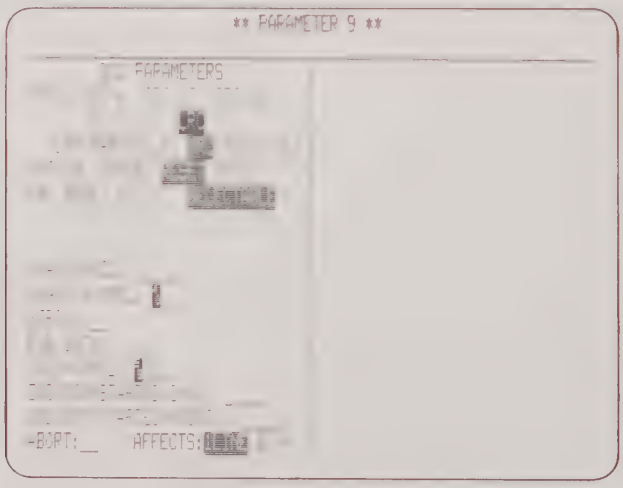


Figure 16-7

16.3.1 BSC/X.25, 7E/X.25, SDLC, and SDLC/NRZI Formats

For Bit-Oriented Protocols (SDLC, SDLC/NRZI, HDLC, and 7E/X.25) and BSC/X.25 the COMSTATE II defaults to the BCC calculations standard for the format selected. The parameters for these calculations cannot be changed on the BCC Parameters screen.

The screen displays the message "BCC AUTOMATIC - SCREEN NOT APPLICABLE" as shown in Figure 16-3. When this message is displayed, changing the selection on the screen has no effect on the BCC test being performed, because the parameters are set internally. Any changes made, however, stay on the screen and take effect if another format (such as ASYNC) is subsequently selected.

NOTE: Changing format selection has no effect on the BCC Parameters menu, but changing codes (from ASCII to EBCDIC, for example) will cause the BCC Parameters menu to display the default parameters for the new code.

16.3.2 SYNC and ASYNC Formats

When SYNC or ASYNC format is selected on Parameter 1, the COMSTATE II will default into BISYNC or SELECTABLE CRC mode depending on the code selected in the Parameter 1 menu. Below are detailed the various default configurations found on the BCC Parameters menu for SYNC or ASYNC format.

(a) EBCDIC or ASCII Code. Selecting EBCDIC or ASCII code in SYNC or ASYNC format will result in the default parameters shown in Figures 16-4 and 16-5. Both EBCDIC and ASCII default into BISYNC CRC mode, but EBCDIC uses a CRC-16 calculation while ASCII uses an LRC calculation to determine BCC. You may redefine the values of the BCC control characters using alternate control characters, standard alphanumerics, or hexadecimal characters. You may also indicate the control character does not exist by leaving the field blank (see Section 16.5 on BISYNC CRC Mode Operation).

(b) EBCD, XS-3, REV EBCD, or SELECTRIC. Selecting EBCD, REV EBCD, or SELECTRIC code for SYNC or ASYNC format will result in the default BCC parameters shown in Figure 16-6. Selecting XS-3 for SYNC or ASYNC format will result in the default shown in Figure 16-7. All four codes default into SELECTABLE CRC mode and use an LRC calculation to determine BCCs. Any of the BCC parameters may be changed to meet specific applications.

(c) IPARS. Selecting IPARS code in SYNC or ASYNC format results in the default BCC parameters shown in Figure 16-8. IPARS defaults into SELECTABLE CRC mode and uses CRC-6 to calculate BCCs. Any of the BCC parameters may be changed to meet specific applications.

16.4 BCC PARAMETERS MENU FIELDS

The BCC Parameters Menu (Parameter 9) controls and displays the values of the COMSTATE II's block check parameters. These parameters are arrayed in 13 fields on the BCC menu. A detailed description of the BCC parameter fields is found in Table 16-4.

Entries on the menu may be made in either alphanumeric or hexadecimal characters. In the START/INCL field only, characters may also be entered in the NOT EQUAL format.

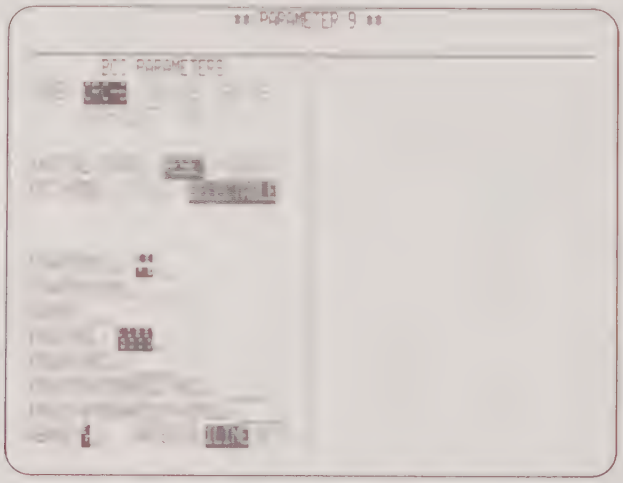


Figure 16-8

16.5 BISYNC CRC MODE OPERATION

The COMSTATE II supports an expanded subset of IBM's "Binary Synchronous Control Procedures" (BISYNC), giving the COMSTATE II flexibility to handle a wide variety of BISYNC-type applications such as Burroughs, Honeywell, Univac, and ISO-1175.

In BISYNC CRC mode, you cannot specify whether control characters are included or excluded from the BCC calculation. You can, however, specify the values of the six BISYNC control characters (DLE, ITB, SOH, ENQ, STX, and ENDS) which appear on the BCC Parameters menu with default character values already assigned. You may redefine the values of the BCC control characters using alternate control characters, standard alphanumerics, or hexadecimal characters. Clearing a field indicates that the control character does not exist. If, for example, intermediate terminal blocking is not used, clearing the US from the ITB field disables the ITB function. If DLE does not activate transparent text mode in your protocol, the DLE field should be cleared. The ENDS field will designate up to three hexadecimal or control characters as END characters.

TABLE 16-4
BCC PARAMETER MENU FIELDS

Line	Field	Meaning
2	(Messages)	All BCC Parameter messages to the operator are displayed on Line 2. See Appendix D for explanation of each message.
3	TYPE	Indicates method of BCC calculation selected. Polynomial expansions of each Type are listed in Table 16-3.
5	LRC PARITY	Displayed when TYPE: LRC is selected. Selects how the LRC parity bit will be handled. LRC = the result of an LRC on the parity bits within the message VRC = the result of a VRC on the BCC character RESET = Ø SET = 1
6	INITIAL STATE	Sets initial state of block check character. RESET = all Ø's PRESET = all 1's
7	CRC MODE	Allows choice between BISYNC and SELECTABLE CRC modes.
8,9	BISYNC control character fields	Data-entry fields displayed for BISYNC CRC Mode only. Allow you to alter the default values for protocol characters used by the CRC logic. The default values are those standard for the code selected on the Parameter 1 menu. Alphanumeric, hexadecimal, and control characters are all legal.
10	START/INCL	When SELECTABLE is chosen, allows you to enter the character(s) on which COMSTATE II initiates BCC accumulation, and includes the character(s) in the accumulation. For this field only, characters may be entered in either normal or NOT EQUAL format.
11	START/N/INCL	When SELECTABLE is chosen, allows you to enter the character(s) on which COMSTATE II initiates BCC accumulation, and does not include the character(s) in the accumulation.
12	STRIP	When SELECTABLE is chosen, allows you to enter the character(s) to be stripped from BCC accumulation.

(continued)

TABLE 16-4 (continued)

Line	Field	Meaning
13	END/INCL	When SELECTABLE is chosen, allows you to enter the character(s) on which COMSTATE II ends BCC accumulation, and includes the character(s) in the accumulation. Initiates processing of BCC. Returns to START State when processing is complete (see Figure 16-10).
14	END/N/INCL	When SELECTABLE is chosen, allows you to enter the character(s) on which COMSTATE II ends BCC accumulation, and does not include the character(s) in the accumulation. Initiates processing of BCC. Returns to START State when processing is complete (see Figure 16-10).
15	END/STAYSTARTED/INCL	When SELECTABLE is chosen, allows you to enter the character(s) on which COMSTATE II ends BCC accumulation, and includes the character(s) in the accumulation. Initiates processing of BCC. Returns to ACCUMULATE State when processing is complete (see Figure 16-10).
16	END/STAYSTARTED/N/INCL	When SELECTABLE is chosen, allows you to enter the character(s) on which COMSTATE II ends BCC accumulation, but does not include the character(s) in the accumulation. Initiates processing of BCC. Returns to ACCUMULATE State when processing is complete (see Figure 16-10).
17	ABORT	When SELECTABLE is chosen, allows you to enter character(s) on which COMSTATE II aborts BCC accumulation and returns to START State (See Figure 16-10).
18	AFFECTS	When SELECTABLE is chosen, allows you to select whether BCC accumulation will be aborted on one or both data lines.

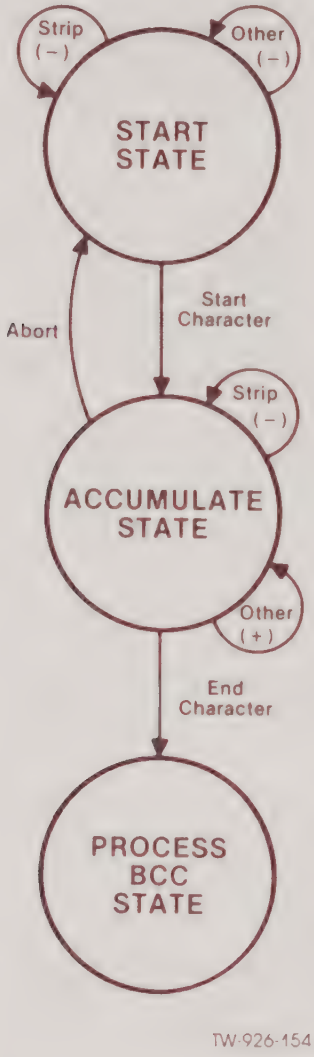


Figure 16-9 Selectable CRC Mode

16.6 SELECTABLE CRC MODE

SELECTABLE CRC mode offers a much simpler default setup than BISYNC, but allows even greater control over the BCC parameters. SELECTABLE mode cannot handle transparency. If your protocol includes transparency, select BISYNC CRC mode.

A SELECTABLE CRC mode state diagram is presented in Figure 16-9. Notice there are only three states compared to the eight in BISYNC. In SELECTABLE CRC mode, however, you may choose multiple Start, End, Intermediate End, Strip, and Abort characters and indicate whether to include or exclude the characters in the BCC accumulation.

A typical BCC Parameters Menu in SELECTABLE CRC mode is illustrated in Figure 16-10. The menu supports up to two hexadecimal characters in the STRIP and ABORT fields, and up to five characters in each of the other fields.

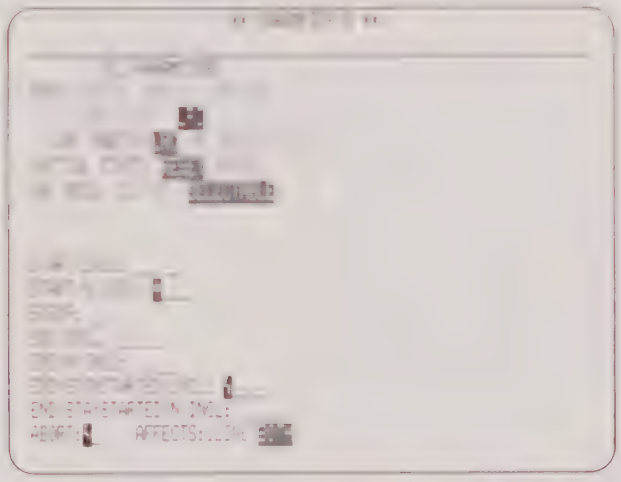


Figure 16-10

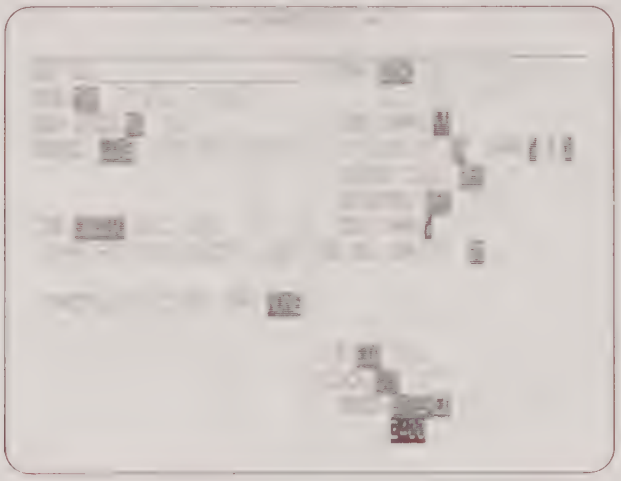


Figure 17-1

17
DATA SIGNAL CHARACTERISTICS

Data signal characteristics, namely EIA versus MIL-188, external versus internal clock, and data speed, are selected on the Parameter 1 menu (Figure 17-1).

17.1 INTERFACE

EIA is the default selection. In this mode, the COMSTATE II operates in accordance with the RS-232/V.24 standard. Selecting MIL will invert the TD and RD data signals but will not affect the stop bits or idle line condition. In Emulate Modes, MARK will be +12 V; and SPACE, -12 V.

17.2 CLOCK

For SOURCE:LINE, this selection field is always displayed in the COMSTATE II. If clock is provided on the communication interface (RS-232/V.24 pins 16 and 17 or 24), EXTernal allows the COMSTATE II to use the external clock for the data receivers. The external clock must be a 1 x baud clock with the negative-going transition occurring at the middle of the data bit period.

For cases where such clock is not provided, INTernal selects the COMSTATE II's internal clock logic, which regenerates clock information from the data.

(a) Emulate DCE. When EMulate DCE has been selected on the Parameter 1 menu, selecting INT CLOCK causes the COMSTATE II to drive pins 16 and 17; if EXT CLOCK is selected, the COMSTATE II loops pin 24 to pins 16 and 17.

(b) Emulate DTE. When EM DTE has been selected on the Parameter 1 menu, selecting INT CLOCK causes the COMSTATE II to put clock on pin 24. EXT CLOCK causes the COMSTATE II to drive pin 24 to mark.

(c) Capture Memory. Clocking for the Capture Memory receivers must be selected on the Record Control menu (Parameter 2 menu).

17.3 SPEED

There are five SPEED selections, the ENTERED data-entry field and four crystal selections, X1 through X4. Maximum speed for program operation is 64 kbps. For precise (rather than approximate) speeds that may be selected, see Appendix K.

When INTernal CLOCK has been selected, the correct speed of the system being monitored must be selected here for clock information to be regenerated from the line data.

When the tape or RAM is being replayed, the speed selected determines the speed at which the data will be played back. The maximum speed for tape playback is 9.6 kbps; the maximum for recording data on tape is 19.2 kbps if RS-232/V.24 lead status is not being recorded and 9.6 kbps when RS-232/V.24 status is being recorded. The RAM will record data up to 72 kbps; and play back data up to 28.8 kbps.

(a) ENTERED. When ENTERED is selected, the data signal speed may be entered using up to five digits or four digits and a decimal point. The actual speed that will be generated internally is determined as follows: Divide the ENTERED speed into 57,600; then round the result to the nearest integer. This becomes the Clock Divider Value. The minimum clock divider value is 2. The true internal speed will be equal to the clock divider value divided into 57,600. This means that the internally generated speed may not be precisely the same as the ENTEREL value.

(b) Optional Crystals (X1 Through X4). For precise clocking above 19.2 kbps or for any nonstandard speed above 2400 bps, optional clock crystals can be factory-installed in the COMSTATE II. The selections X1 through X4 will always appear on the menu, but if a crystal corresponding to your crystal selection has not actually been installed, no clock will be generated.

If crystal options are present, the lowest-speed crystal will be selected by X1, the next-lowest by X2, and so on.

18
CRT DISPLAY CONTROL

The CRT Control menu is on the Parameter 2 display. Other CRT enhancements can be controlled manually (see Sections 9 and 10) or by triggers (see Section 21.4).

18.1 DISPLAY MODE

There are eight choices in the DISPLAY MODE window (see example in Figure 18-1). These selections are SINGLE, DUAL, X.25 FRAME TRACE, X.25 PACKET TRACE, SDLC TRACE, SNA TRACE, PROMPT/STATE, and PROMPT.

To display data, select either SINGLE or DUAL line. These two display modes are described in Sections 8.1 and 8.2.

(a) SINGLE-LINE DISPLAY. SINGLE line is the default selection.

(b) DUAL-LINE DISPLAY. DUAL line maintains time correlation between DCE and DTE data. Dual-line display is useful for viewing simultaneous FDX data, but it should only be used when required because the single-line display uses the CRT and buffer space more efficiently.

NOTE: Dual-line display should not be used at data rates above 64 kbps. When dual line is used above 64 kbps, the unit may miss characters and may not maintain time correlation between TD and RD properly.

(c) X.25 FRAME TRACE. This is a meaningful DISPLAY MODE selection when BSC/X.25 or 7E/X.25 has been selected as FORMAT on the Parameter 1 menu. When you select X.25 FRAME TRACE, data will not be displayed in Run Mode. Instead you will see a real-time sequential display of frame-control mnemonic expansions. See Section 47.3 for complete explanations of these displays.

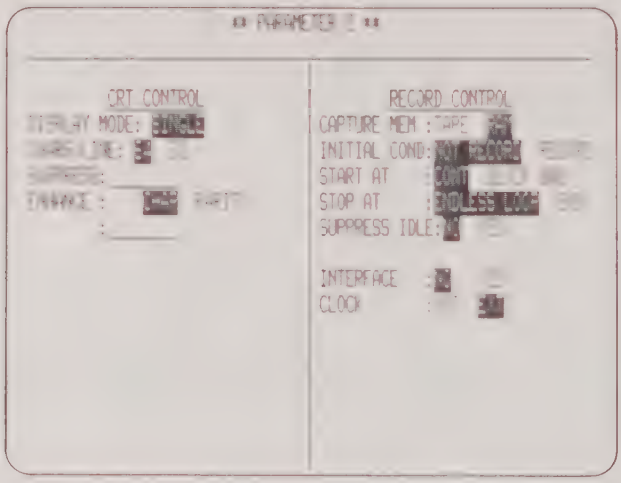


Figure 18-1 DISPLAY MODE is a rotating window.
Press ROLL to make selections.

(d) X.25 PACKET TRACE. X.25 PACKET TRACE is a meaningful DISPLAY MODE selection when BSC/X.25 or 7E/X.25 has been selected in the FORMAT field of the Parameter 1 menu. When you select X.25 PACKET TRACE, in Run Mode you will see a sequential display of packet-type mnemonic expansions rather than data. (See Section 47.3 for complete explanations of these displays.)

(e) SDLC TRACE. This is a meaningful selection if SDLC or SDLC/NRZI has been selected as FORMAT on the Parameter 1 screen. When SDLC Trace is selected, frame control mnemonics are sequentially displayed in Run Mode for the DTE and the DCE side of the line. See Section 47.3 for further information on this type of display.

(f) SNA TRACE. If SDLC or SDLC/NRZI is selected in the FORMAT field of the Parameter 1 menu, SNA Trace may be selected as the Display Mode. SNA Trace provides a real-time expansion of SDLC-SNA frames. (See Section 48 for a full description of these displays.)

(g) PROMPT/STATE TRACE. To display a real-time log of all state changes and prompts in Run Mode, PROMPT/STATE is selected in the DISPLAY MODE field (see Section 8.4).

(h) PROMPT TRACE. Select PROMPT as the DISPLAY MODE to display a real-time log of all prompts in Run Mode (see Section 8.5).

18.2 CHARACTERS PER LINE

In the CHARS/LINE field, you may select either 64 or 32. This field is present only when DUAL or SINGLE is selected as the DISPLAY MODE.

18.3 SUPPRESS

(a) Character List. For SINGLE- or DUAL-line display mode you may choose up to eight characters to be suppressed from the CRT display. The suppressed characters will not appear on the CRT or in the CRT buffer, which allows you to obtain a highly condensed, selective display. However, they will be received, considered by the triggers, included in counting and timing where applicable, and recorded if data is being recorded.

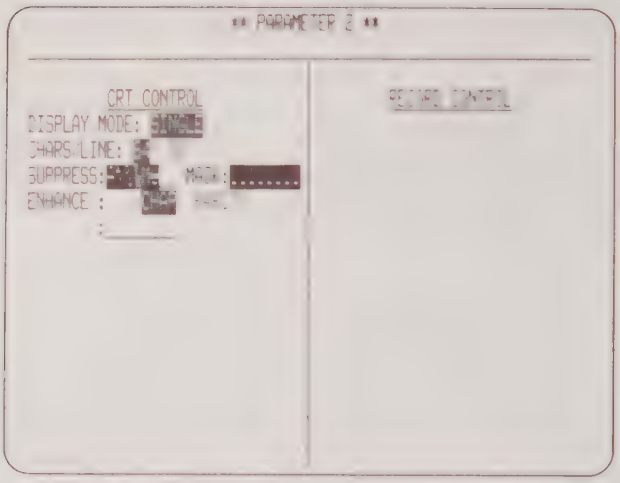


Figure 18-2

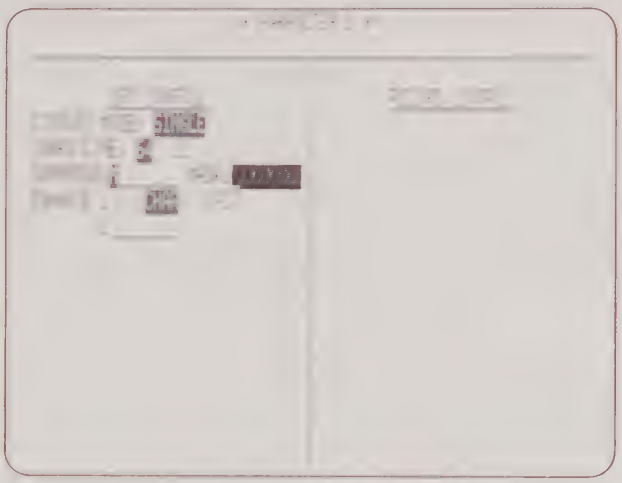


Figure 18-3

The characters to be suppressed can be entered directly from the keyboard and may include --

- Upper- and lower-case alpha characters and numerals;
- Control characters;
- Hexadecimal entries;
- Flag bytes (the FLAG key; only in 7E/X.25, SDLC, and SDLC/NRZI modes);
- One Bit Mask;
- All characters NOT EQUAL to a given character or bit mask.

Figure 18-2 shows an example of each type of entry in the Suppress field.

(b) Flag Byte. The FLAG key must be used for the 7E (hex) Flag in X.25 and SDLC protocols. If 7E is entered with HEX on, the logic will not read this as a Flag; in an information frame, this will be interpreted as a data 7E (hex).

(c) Bit Mask. With the cursor on the SUPPRESS line, press the BIT MASK key. At the cursor position a low-intensity M will be entered, and at the right end of the line, MASK followed by an eight-place data-entry field will appear (see Figure 18-3). The cursor will be at the first place in this field.

Each X in the data-entry field represents one bit of an 8-bit character, with the low-order, first serial bit on the right. X's mean Don't Care. You may replace any of the X's with ones and (or) zeros. If, for instance, you enter 00 for bits 8 and 7, the pattern will now be 00XX XXXX. All characters having 00 for bits 8 and 7 will now be suppressed, as indicated by the low-intensity M in the list of suppressed characters (Figure 18-4). In EBCDIC all control characters have zeros for bits 7 and 8, so if the code selection were EBCDIC, all control characters would now be suppressed from the display.

NOTE: A low-intensity character in a data-entry field always indicates that the character represents something other than itself.

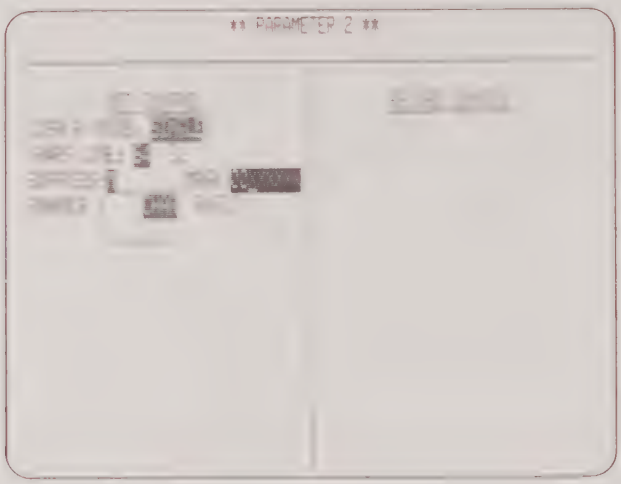


Figure 18-4

To return to the SUPPRESS list, use ENTER. To get back to the MASK field, place the cursor on the mask position in the SUPPRESS list and press BIT MASK again.

Changing the code selection does not affect the number of bits displayed in the mask. If you have selected a code with less than eight information bits, say five, use the five lower-order (rightmost) bits and ignore the three excess higher-order bits.

(d) Not Equal. You may suppress all characters not equal to any given character. To suppress all characters but U for example, press NOT EQUAL, then SHIFT-U. Figure 18-2 shows U displayed in the SUPPRESS list with a horizontal bar through it to indicate "not equal." To suppress everything but characters that fit a certain bit mask, press NOT EQUAL, then BIT MASK. All characters that do not fit whatever pattern you then enter for the bit mask will be suppressed, and the low-intensity M in the SUPPRESS list will have a horizontal bar through it.

18.4 ENHANCE

(a) Character. Enhanced characters will be displayed in blinking, bright, reverse image. If you select CHAR on the ENHANCE line, you may enter up to eight characters on the next line. Valid characters are the same as for SUPPRESS.

(b) Parity. If you select ENHANCE PARITY, each character with a parity error will be displayed with a horizontal bar through it.

NOTE: For data formats consisting of 8 data bits plus parity, the COMSTATE II will not enhance

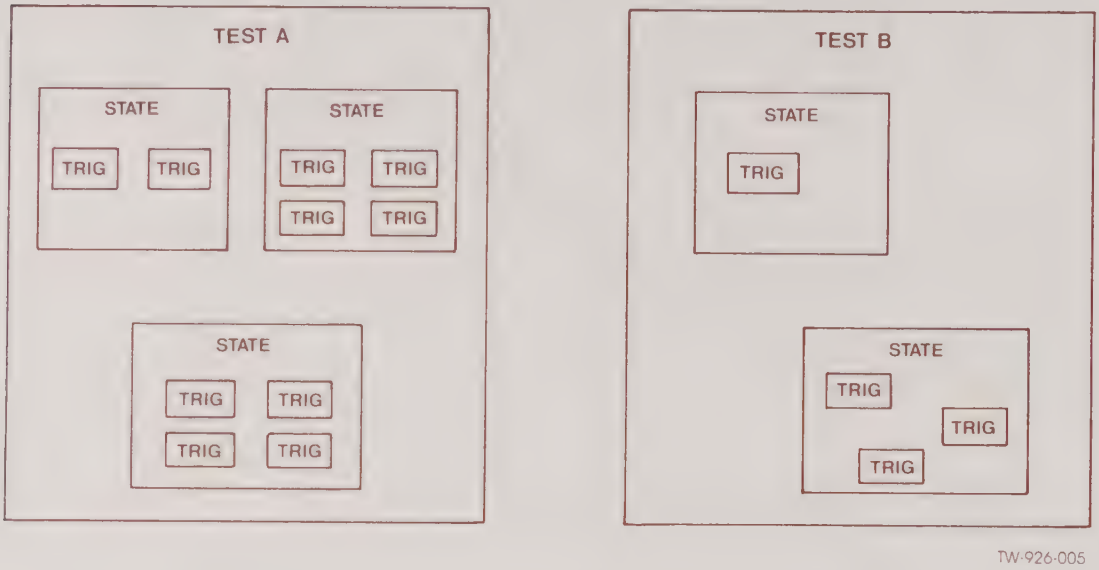


Figure 19-1 Map of relationship of COMSTATE II tests, states, and triggers. There are always two tests, but the number of states in a test and number of triggers in a state are selected by the operator.

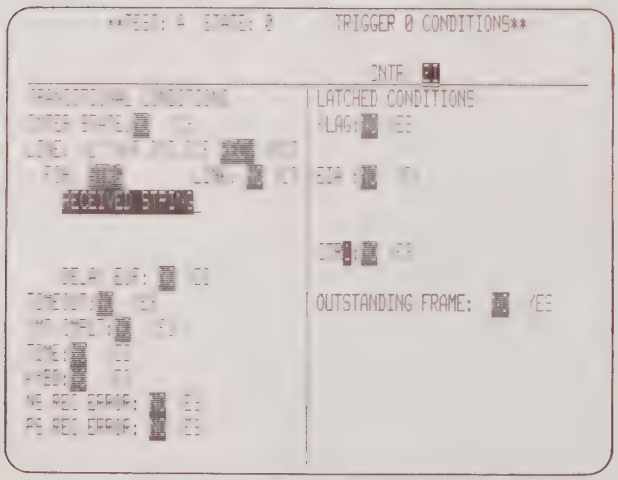


Figure 19-2

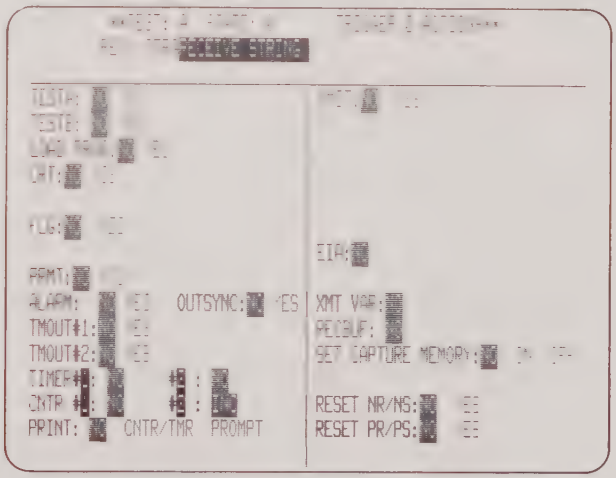


Figure 19-3

19
INTRODUCTION TO COMSTATE II TESTING

The INTERVIEW COMSTATE II can conduct two tests simultaneously. These tests may be completely independent of each other, or they may intercommunicate with and control each other. The relationship of tests to states and triggers, which is explained in the following sections, is diagrammed in Figure 19-1.

19.1 TRIGGERS

The basic element of COMSTATE II testing is the trigger. A trigger is a simple, effective method of nonsequential programming that relieves you of the time-consuming task of learning a language and writing code. You simply specify what condition or combinations of conditions you want a trigger to look for and what action or actions you wish it to take.

Figures 19-2 and 19-3 show the two menus, Conditions and Actions, that comprise one COMSTATE II trigger. When the trigger sees the string RECEIVED STRING selected on the Conditions menu shown in Figure 19-2, it will increment Counter 2, as selected on the Actions menu shown in Figure 19-3.

There are 128 triggers. Selections on the trigger menus are made in the same way as on the various Parameter menus. Triggers and their use are described in Sections 20 through 25.

19.2 STATES

Triggers function in "States." A State consists of a group of triggers that will be simultaneously active during a test. One state may be active in the test at any instant. You can assign up to eight triggers to a state, so the maximum number of triggers that can be active in a test at any instant is eight.

You determine the number of states in a test by assigning states to it. Practically, the maximum number of states depends on how many triggers you assign to each state. The absolute maximum number of states is 128, but this could occur only if you assigned just one of the 128 triggers to each state.

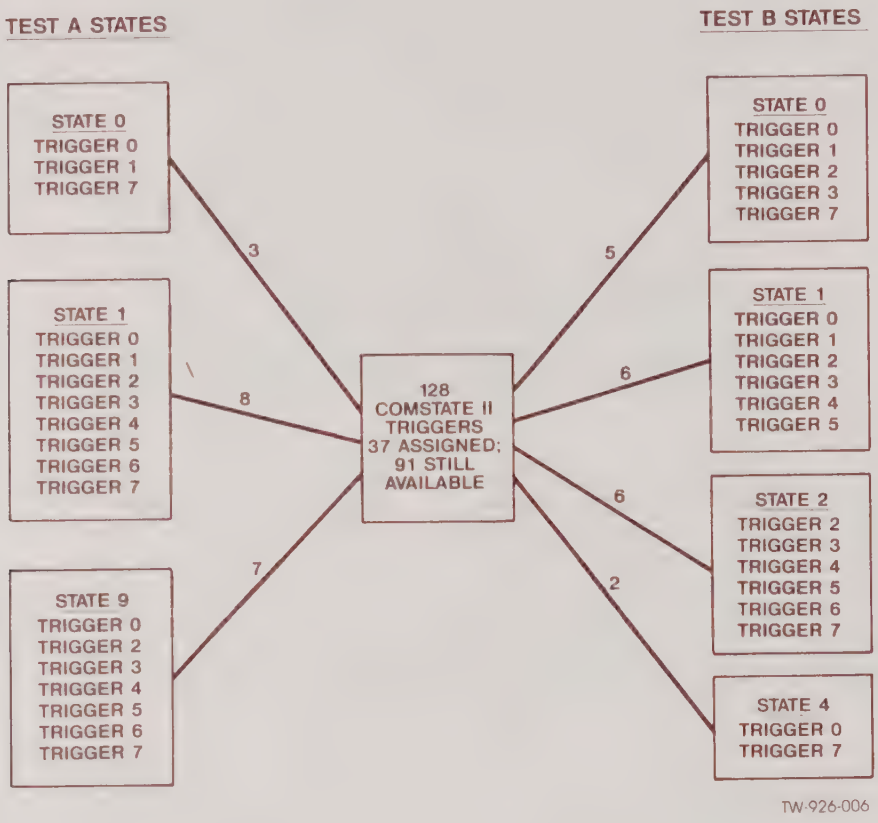


Figure 19-4 Example of a COMSTATE II Test Configuration: 37 triggers are in use in Tests A and B; 91 more are still available. Notice that each trigger is numbered only as it is assigned to a state. The state number is necessary to identify and find a trigger. Neither states nor triggers need be used in numerical order.

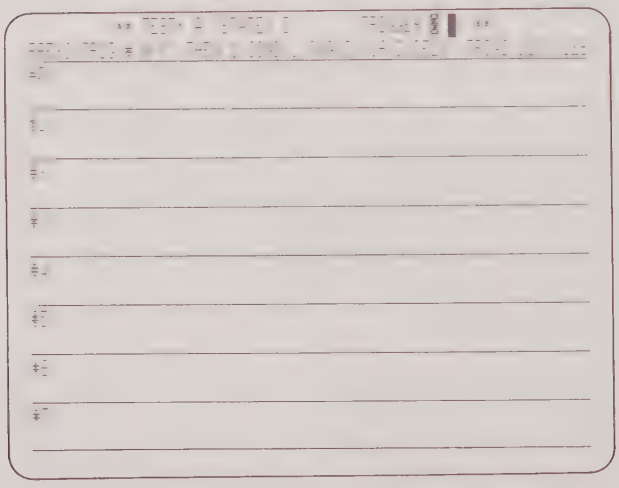


Figure 19-5 Default Trigger Summary for Test A.

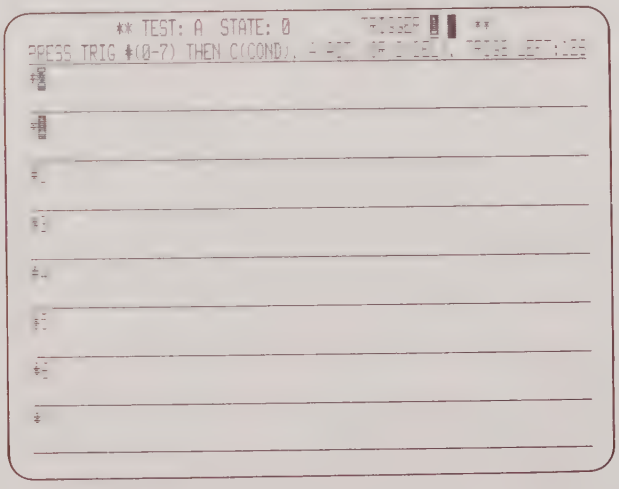


Figure 19-6

Figure 19-4 is an example of the allocation of triggers to states and states to the two tests, Tests A and B.

19.3 ASSIGNING TRIGGERS TO STATES

The default state is State 0 of Test A. After power-up, the TRIG key automatically displays the Trigger Summary (see Figure 19-5) for State 0. However, no triggers have actually been assigned to State 0. If you display the menus for one or more triggers -- by pressing TRIG, the trigger number, and C or A -- these triggers are then automatically assigned to State 0. This occurs whether or not you make any selections on the trigger menus. On the Trigger Summary, numbers of assigned triggers are displayed in bright reverse-image as shown in Figure 19-6.

To configure any other state in Test A, press the STATE TEST A key, which displays the state menu for Test A (see Figure 19-7; also Section 19.5). The cursor will be in the state number field on the header line of the menu. Here, enter the number of the state that you want (Figure 19-8) and press TRIG again. The Trigger Summary (Figure 19-9) for the selected state will now be shown.

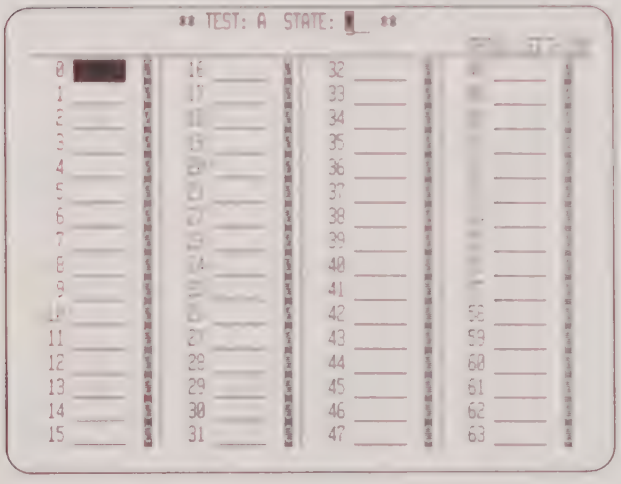


Figure 19-7 Default State Test A menu.

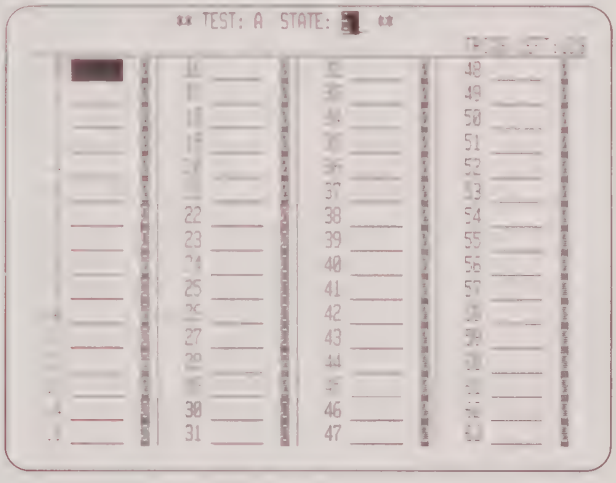


Figure 19-8 State Test A menu with State 6 selected.

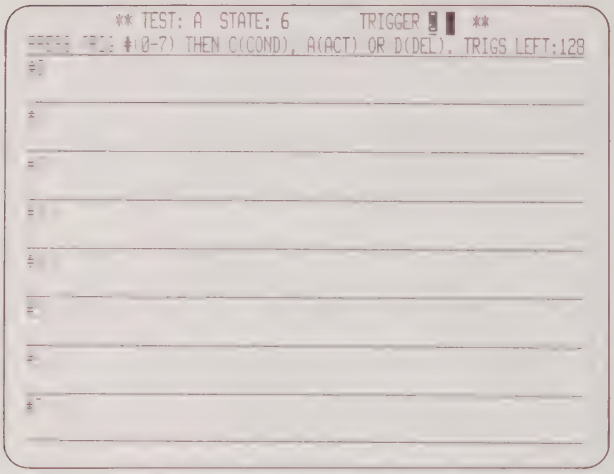


Figure 19-9 Default Trigger Summary for State 6 of Test A.

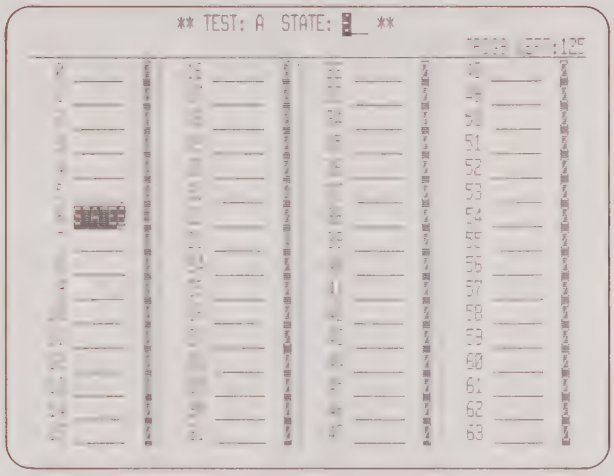


Figure 19-10 Naming State 6 on the Test A menu (compare this with Figure 19-8). Notice that three triggers have already been assigned to STATE6.

The STATE TEST B key displays the corresponding menu for Test B with State 0 of Test B the default selection.

19.4 CLEARING AND DELETING TRIGGERS

Like other menus, any trigger Conditions or Actions menu can be cleared, that is, restored to default condition, by displaying it and operating CTRL-CLEAR FIELD. The displayed menu will be cleared and the other menu for that trigger will automatically be displayed. When both menus for a trigger are cleared, that trigger will automatically be withdrawn from the State.

With a Trigger Summary displayed, you may clear and withdraw from the State any trigger on the summary (both Conditions and Actions) with three keys in succession, TRIG, the trigger number, and the d key.

To clear an entire state, display the Trigger Summary for that state and press CTRL-CLEAR FIELD.

19.5 NAMING STATES: THE TEST MENUS

There are two Test menus, which assign and name the states for Tests A and B. The menu for Test A is displayed by pressing the STATE TEST A key; that for Test B, by pressing the STATE TEST B key. Figure 19-7 shows page 1 of the Test A menu; page 2 displays the data-entry fields for states 64 through 127.

To select a state, write over the number in the header line of the menu with any number from 0 to 127. If there will be fewer digits in the new number, clear the field first to avoid leaving an extra digit in your selection. The default state is State 0.

> NOTE: Whenever the COMSTATE II enters Run Mode, activity both in Test A and Test B begins in the first state, counting from zero, in which a trigger is assigned.

Press the ENTER key. The cursor will move to the data-entry field for the selected state, which will be displayed in bright reverse image. If you select a state greater than 63, page 2 of the menu will automatically be displayed.

In the data-entry field, enter a name for the state (you can delay naming it until you have made trigger selections if you wish). Up to six alphanumeric and control characters are legal on each data-entry line. Do not include spaces in the name. To select another state, press either the UP arrow or the appropriate STATE TEST key; enter the new number and press ENTER to go to its name field.

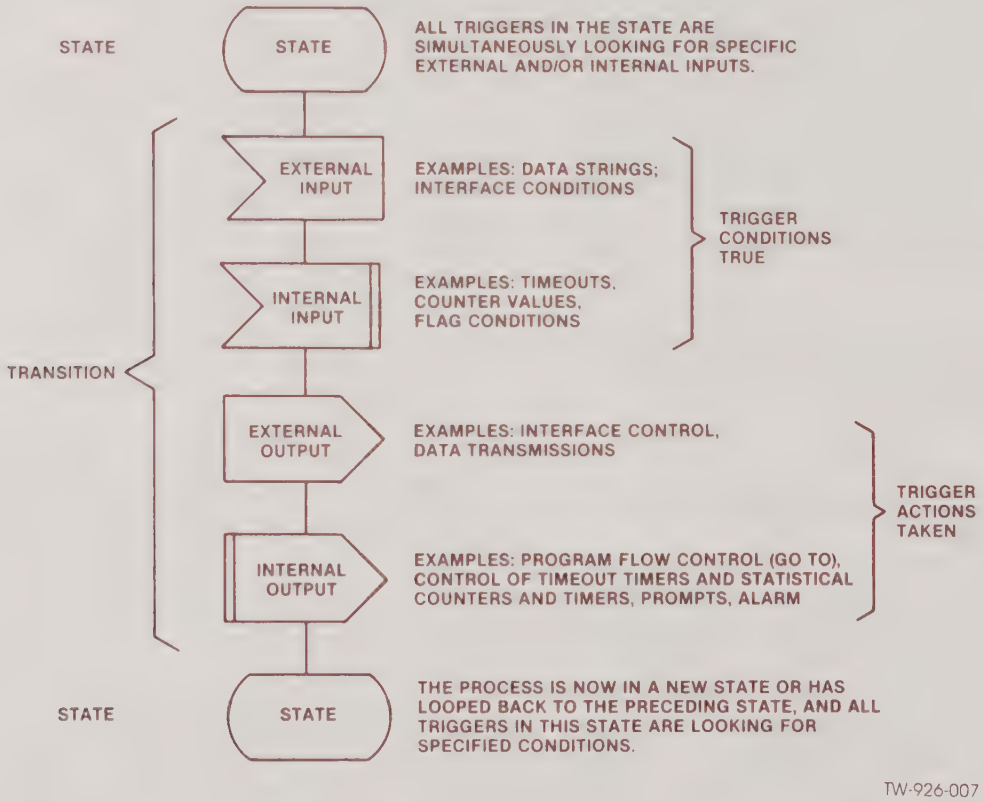
If you now depress the TRIG key, the Trigger Summary for the currently selected state will be displayed. If you have not named the state, the state number will be shown on Line 1 of the Trigger Summary as in Figure 19-9. If you have named the state, the state name will be shown instead of the number.

On the State Test menu, each time a trigger is assigned to a state the low-intensity number to the right of the state name field will increment (see Figure 19-10). If you have not named the state, this number will be the only indication that you are using this state. The TRIGS LEFT field at the upper right of the display will decrement by one each time you assign a trigger to a state.

19.6 PROGRAM FLOW SUGGESTIONS: COMSTATE TECHNIQUE

To paraphrase CCITT Recommendation Z.101, a state is a condition in which a process is inactive while it waits for certain well-defined inputs. An input is any incoming external or internal signal. When the process receives the expected input, or inputs, it takes the actions specified for the circumstance and goes to a new state. The sequence of activity that occurs between states is called a "transition." This method of determining a process is a variety of structured programming.

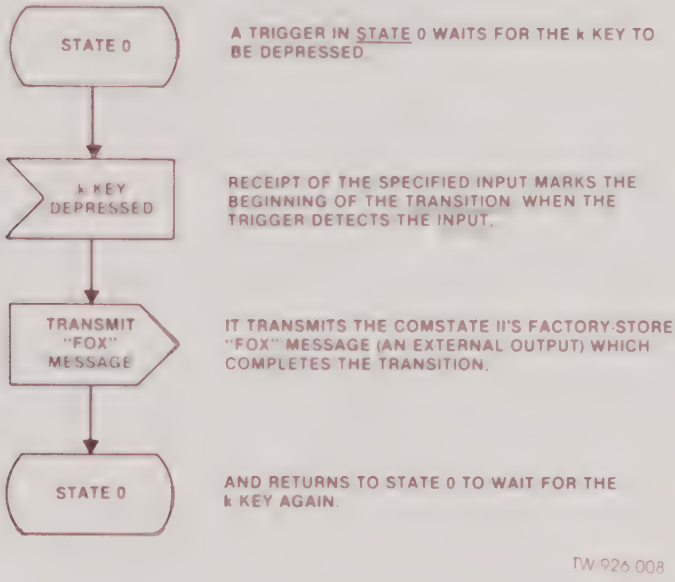
If you think of COMSTATE technique in these terms, you will find a clear analogy. The following state diagram uses the symbol conventions of CCITT Recommendation Z.101 to show how COMSTATE trigger states parallel data communications states.

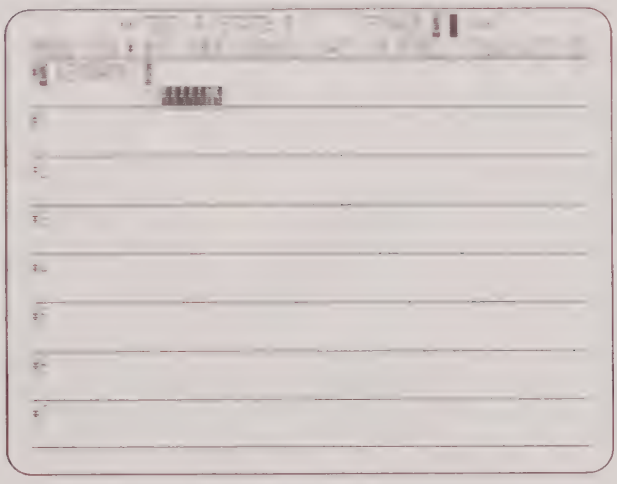

STATE
STATE
ALL TRIGGERS IN THE STATE ARE SIMULTANEOUSLY LOOKING FOR SPECIFIC EXTERNAL AND/OR INTERNAL INPUTS.
EXTERNAL INPUT
EXAMPLES: DATA STRINGS; INTERFACE CONDITIONS
INTERNAL INPUT
EXAMPLES: TIMEOUTS, COUNTER VALUES, FLAG CONDITIONS
TRIGGER CONDITIONS TRUE
TRANSITION
EXTERNAL OUTPUT
EXAMPLES: INTERFACE CONTROL, DATA TRANSMISSIONS
INTERNAL OUTPUT
EXAMPLES: PROGRAM FLOW CONTROL (GO TO), CONTROL OF TIMEOUT TIMERS AND STATISTICAL COUNTERS AND TIMERS, PROMPTS, ALARM
TRIGGER ACTIONS TAKEN
STATE
STATE
THE PROCESS IS NOW IN A NEW STATE OR HAS LOOPED BACK TO THE PRECEDING STATE, AND ALL TRIGGERS IN THIS STATE ARE LOOKING FOR SPECIFIED CONDITIONS.

TW-926-007

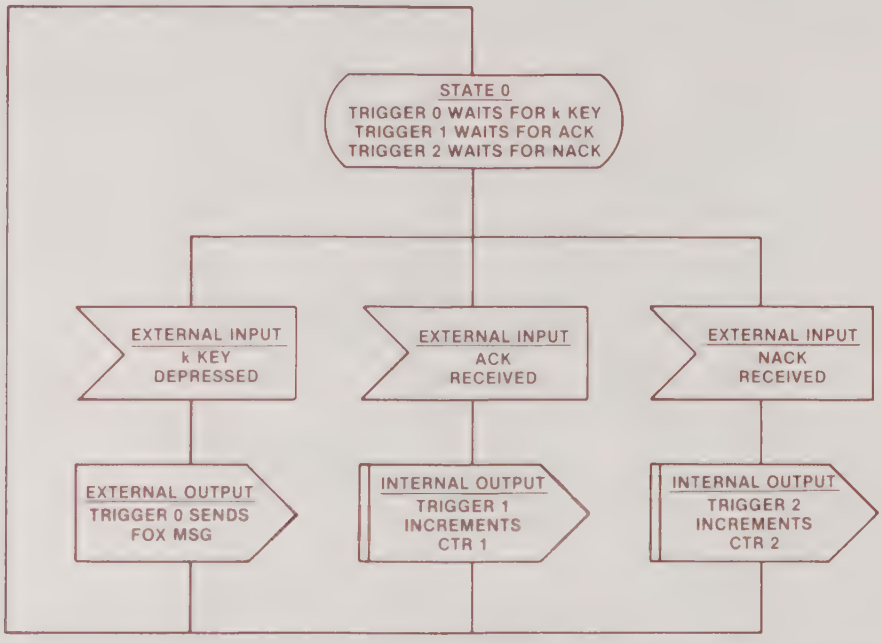
The most efficient form of COMSTATE II test will always be one that emulates data communications states. The following examples illustrate how to do this.

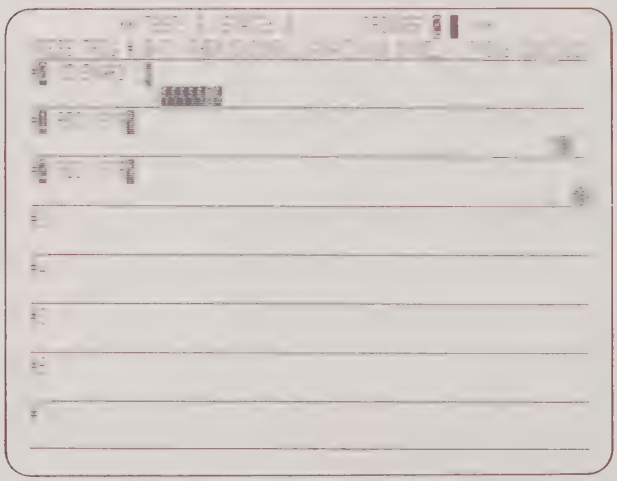
(a) One State, One Trigger: This is the simplest possible test.


STATE 0
A TRIGGER IN STATE 0 WAITS FOR THE k KEY TO BE DEPRESSED.
k KEY DEPRESSED
RECEIPT OF THE SPECIFIED INPUT MARKS THE BEGINNING OF THE TRANSITION. WHEN THE TRIGGER DETECTS THE INPUT,
TRANSMIT "FOX" MESSAGE
IT TRANSMITS THE COMSTATE II'S FACTORY-STORED "FOX" MESSAGE (AN EXTERNAL OUTPUT) WHICH COMPLETES THE TRANSITION.
STATE 0
AND RETURNS TO STATE 0 TO WAIT FOR THE k KEY AGAIN.
TW 926 008



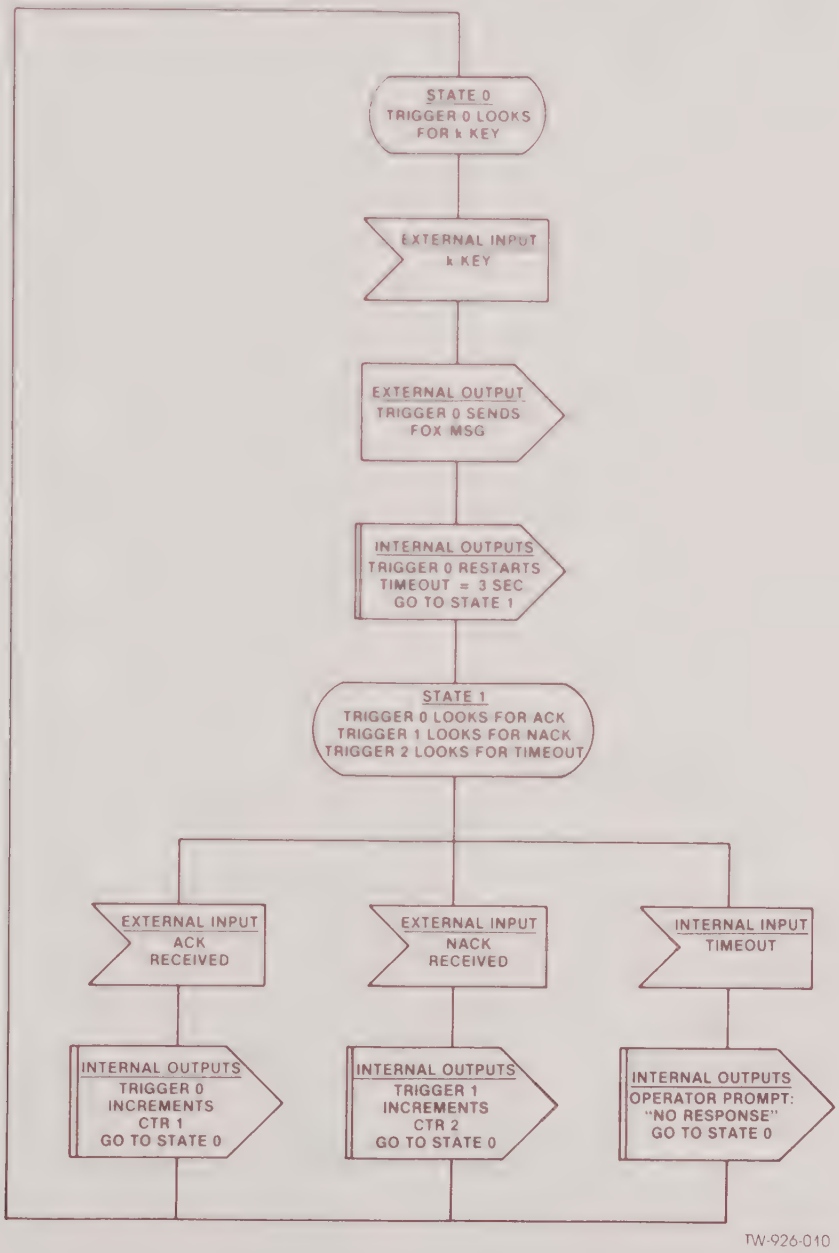
(b) One State, Three Triggers:



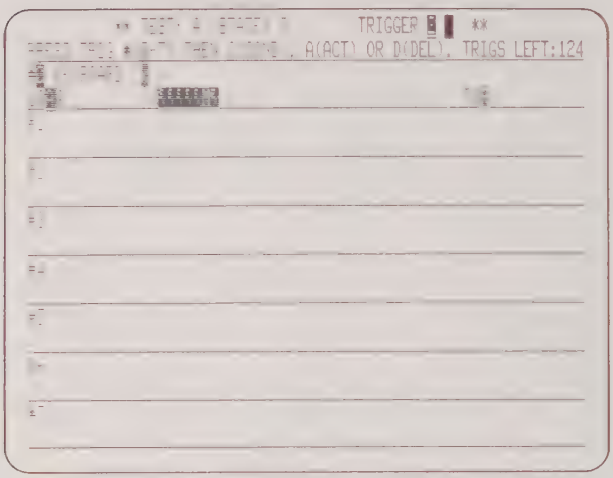


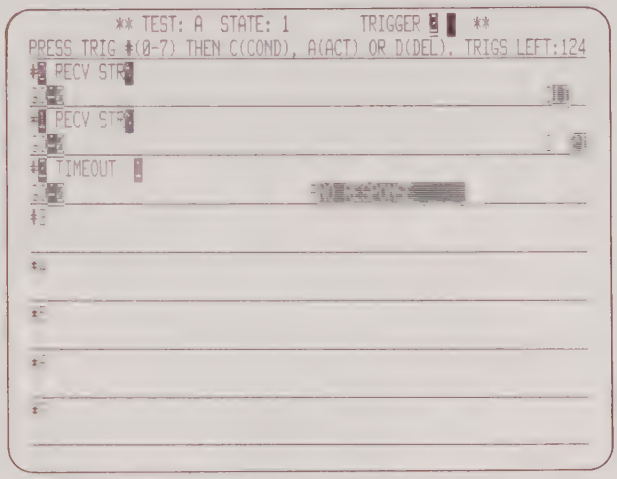
In this single-state program, the COMSTATE II would increment a counter even if ACK or NACK were received before it sent the FOX message. If there were no response, this might not be apparent to the operator. The test attempts to use one state for two sequential phases of a process: a transmission and the response. To correct this, the following example uses two states.

(c) Two States, Four Triggers:



TW-926-010




** TEST: A STATE: 1 TRIGGER 0 **
PRESS TRIG #(0-7) THEN C(COND), A(ACT) OR D(DEL). TRIGS LEFT:124
#0 RECV STR
#1 RECV STR
#2 TIMEOUT

All trigger actions are taken immediately when a trigger is true. This means that the test process transitions to State 1 as soon as the trigger in State 0 is true. At the same instant, it initiates transmission of the FOX message, so triggers in State 1 see the entire FOX transmission. If the ACK or NACK response is received before timeout, the test will be in State 0 before the timeout can occur, and the timeout timer will be reset before the test changes to State 1.

ACKs or NACKs arriving before the end of the FOX message could still be counted. If you need to prevent this possibility, on the State 0 Trigger 0 Actions menu select TEST A:NO. On the State 0 Trigger 1 Conditions menu, select XMT CMPLT:YES; on the Actions menu, select TEST A:YES and enter 1 (one) in the GO TO field. The test will not go to State 1 until the entire Fox message has been transmitted, so the counters will not be able to see ACKs or NACKs before then.

19.7 THE PROMPT-STATE AND PROMPT TRACE DISPLAYS

The COMSTATE II has two unique display features to help you follow the course of a program or test, the Prompt-State Trace and the Prompt Trace (see Sections 8.4 and 8.5). You can choose state names and design the trigger Prompts (Section 21.6) to enable you to follow the sequence of program activity on the screen or review it on a printout. In addition to the trace displays, you can also selectively print out prompts with date-time stamping (see Section 21.18). These features give you the flexibility and power to track either the COMSTATE test sequence or selected data communications events over extended periods of time.

19.8 PROTOCOL SPREADSHEET SCREEN

The PROTOCOL SPREADSHEET summarizes a test in a single display that can be scrolled. Changes and new entries can be made directly onto the spread sheet, shown in Figure 19-11. See Sections 27 through 31 for a detailed description.

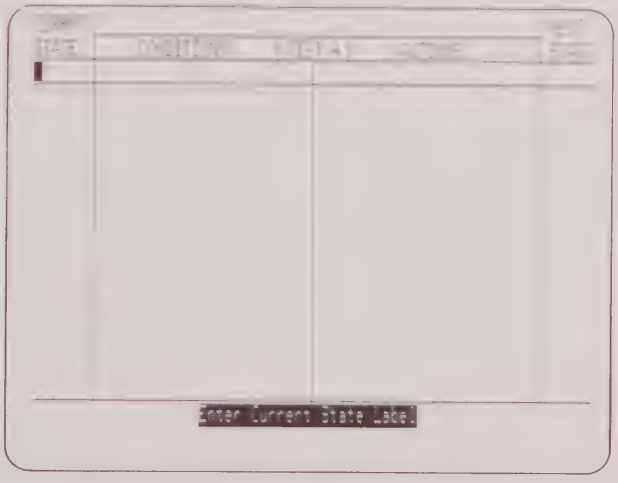


Figure 19-11 PROTOCOL SPREADSHEET Screen.

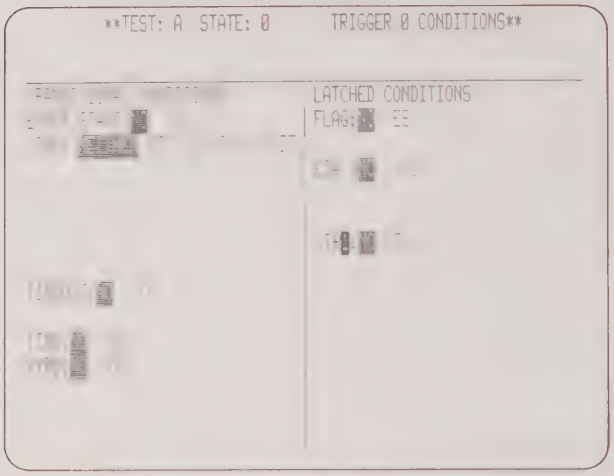


Figure 20-1

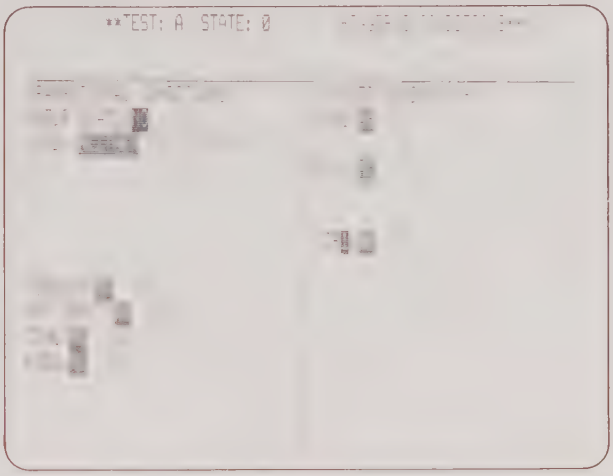


Figure 20-2

20
TRIGGER CONDITIONS

20.1 INTRODUCTION
TRANSITIONAL VERSUS LATCHED CONDITIONS

Figure 20-1 shows a Trigger Conditions menu as it appears for the default (BISYNC monitor) condition of the Parameter 1 menu; Figure 20-2 shows this menu for an Emulate (interactive testing) mode; and Figure 20-3, for an Emulate mode and 7E/X.25 Format. Selections that are only useful for X.25 are not shown for BISYNC format; and those that are not valid in Monitor Mode are only shown for the Emulate modes.

The screen is split into Transitional Conditions and Latched Conditions. Each condition in the left-hand column can be true only instantaneously, and therefore it would not be logical to select more than one condition from this column. The latched conditions, on the other hand, are likely to remain true long enough so that the trigger can monitor a configuration of latched conditions, as well as one of the transitional conditions in the left-hand column.

Triggers may also monitor transitions to the latched conditions, as will be seen in Section 20.16, for example.

NOTE: Selecting a latched condition alone will only activate a trigger in one of two cases: (1) if the condition is true as the state is entered, (2) if the transition to the latched condition occurs within the state. To test for a stable latched condition, select a transitional condition on the same menu. To retest a trigger with a latched condition alone, leave and reenter the state which contains the trigger.

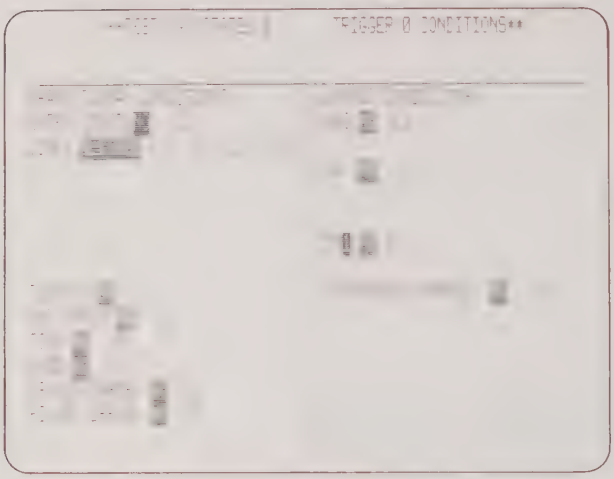


Figure 20-3

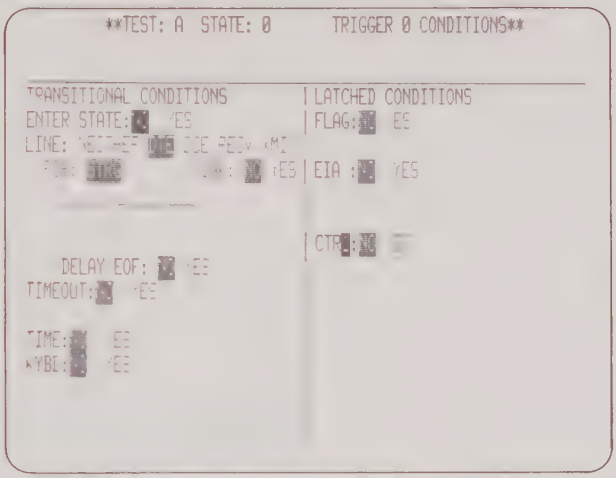


Figure 20-4

20.2 ENTER STATE

If YES is selected, then when the COMSTATE II enters the state to which the trigger is assigned, that is, when the triggers of this state become active, this condition will be true once. Since the first state in each test in which a trigger is assigned is active immediately when Run Mode is entered (see Note, Section 19.5), the Enter State condition can be used to start a test. Used in conjunction with the TEST A or TEST B trigger action (see Section 21.2), the Enter State condition allows you to control the sequence in which states become active in each test.

20.3 LINE

This selects which data lead the trigger will monitor for the condition defined on the next five lines of the menu (see Figure 20-4). If you want to monitor neither TD nor RD, select NEITHER, which is the default selection, and all data condition fields will go away. (Compare Figures 20-4 and 20-1.)

When DTE is selected, data from the DTE (TD) will be monitored; when DCE is selected, data from the DCE (RD) will be monitored. When MODE MON is selected on the Parameter 1 menu, choose one of these selections.

The next two selections are intended for use in the Emulate Modes. They allow you to change the Emulate Mode of a program without modifying the trigger menus. When RECV is selected the COMSTATE II will always monitor the opposite lead from that on which it is transmitting: in Emulate DTE mode the trigger will monitor RD; in Emulate DCE mode, the trigger will monitor TD. When XMIT is selected, the trigger will monitor the data lead on which the COMSTATE II is transmitting.

TABLE 20-1
TRIGGER LINE CONDITIONS VS. FORMAT SELECTIONS

Format	Line Conditions
SYNC	STRG, 1 OF, PARER, GDBCC, BDBCC
BSC/X.25	STRG, 1 OF, PARER, GDBCC, BDBCC, FRAME, PACKET
7E/X.25	STRG, 1 OF, PARER, GDBCC, BDBCC, FRAME, PACKET, ABORT
SDLC, SDLC/NRZI	STRG, 1 OF, PARER, GDBCC, BDBCC, FRAME, ABORT
ASYNC	STRG, 1 OF, PARER, GDBCC, BDBCC

20.4 FOR

This selection field (see Figure 20-4) is actually a window on a rotating selection field. It appears on Line 5 when DTE, DCE, RECV, or XMIT has been selected on the preceding line. The selections in this field depend on the Parameter 1 Format selection, as shown in Table 20-1. To use the window field, repeat the ROLL key to display each successive choice; or use SHIFT-ROLL to see the selections in the reverse sequence. Press the ENTER key to leave the field.

(a) String. The default selection is STRG, which allows you to enter a string of up to 16 characters on the following line. The entire, exact sequence of characters entered must be received for the condition to be true.

(b) "One of" Character. When "1 OF" is selected, the trigger looks for any one of the characters in the list of up to 16 characters entered in the next field.

(c) Parity Error. PARER selects PARity ERror as a trigger condition. The logic automatically computes parity in accordance with your selections under CODE on the Parameter 1 menu.

NOTE: For data formats consisting of 8 data bits plus parity, PARity ERror is not a valid trigger condition.

(d) Good or Bad Block Check. GDBCC (GooD Block Check Calculation) and BDBCC (BaD Block Check Calculation) cannot be used as conditions unless Received Block Check is on in the unit (Parameter 1 menu; see Section 16.1). Select GDBCC or BDBCC when you want the trigger to take action on receipt of the BCC. The COMSTATE II does the appropriate type of block check calculation for the protocol entered on the Parameter 1 and Parameter 9 menus and compares it with the received block check characters. (See Table 16-2 for block check calculations done by the COMSTATE II.)

(e) Frame. This selection comes up for BSC/X.25, 7E/X.25, SDLC, or SDLC/NRZI. It enables you to look for a frame satisfying characteristics that you specify in the fields now displayed on the next two lines. Please see Section 46.3 (on Bit-Oriented Protocols) for detailed information about this trigger condition.

(f) Packet. This selection is displayed only for BSC/X.25 or 7E/X.25. You can use it to look for a packet satisfying specific conditions. Please see Section 46 for instructions.

(g) Abort. For 7E/X.25, SDLC, or SDLC/NRZI, you can choose ABORT as a trigger condition. In 7E/X.25, seven consecutive 1's always constitute an ABORT. In SDLC or SDLC/NRZI, an ABORT can be received only during a frame, never during idle time.

20.5 CHARACTER-ENTRY FIELD

This field appears only if STRG or 1 OF has been selected. It is the data-entry line for a character string, if STRG has been selected, or for a character list, if 1 OF has been selected. Up to 16 characters may be entered.

(a) String Entry. The 16 characters allowed in the string may include any of the following in any order or number:

- All upper and lower-case alpha characters and numerals on the keyboard.
- All control character mnemonics on the keyboard.
- Two-digit hexadecimal entries. These are entered using alphanumeric keys 0 through F while HEX is ON. Characters entered in hexadecimal are not translated and parity is not calculated for them, so you must include the parity bit, whether good or bad, in your entry.
- Flags. You must use the FLAG key to enter the 7E (hex) Flag byte used in bit-oriented protocols. The logic will not read a hexadecimal entry made with the HEX key as a flag.
- ≠ (Not Equal) entries. When a character key is preceded by the ≠ key, all characters not equal to that character will satisfy that position in the string.
- Don't Care entries. The DON'T CARE key permits any character received in that position in the string to satisfy the condition.
- Four Bit Masks (Bit Masks are introduced in Section 18.3).

To enter a Bit Mask, use the BIT MASK key at the desired location in the string. Each time you press BIT MASK, a new mask field appears below the string-entry field. To move the cursor to the next position in the string-entry field, press ENTER. The maximum number of Bit Masks is four. The mask fields are numbered M1 through M4, to denote the order in which they appear in the string (Figure 20-5).

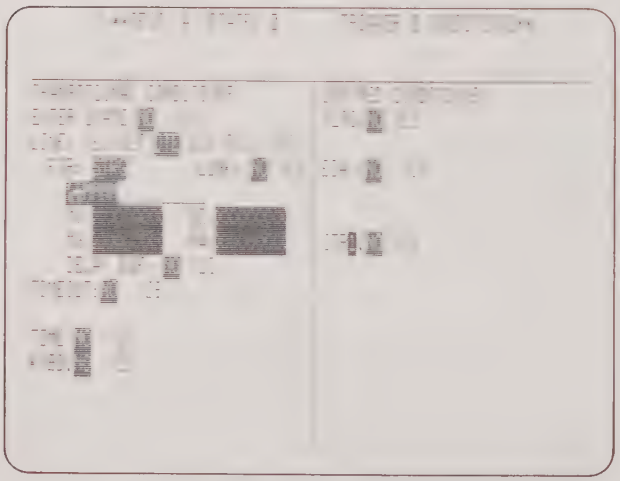


Figure 20-5

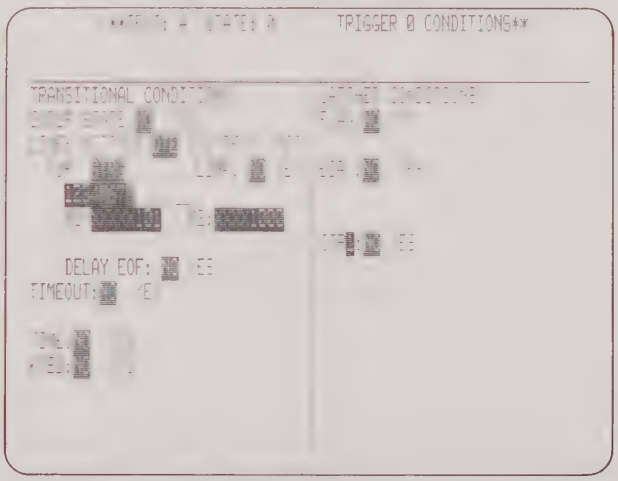


Figure 20-6

If you have used, for example, Bit Masks 1 and 2 at positions 5 and 8 of a string (as in Figure 20-6), you may decide to change the character at position 1 to a bit mask: Return the cursor to position 1 of the string and press BIT MASK. The character at position 1 will be overwritten with the low-intensity M, the two prior bit masks will be renumbered to 2 and 3, and their menu location shifted to make room for the new Bit Mask 1. The cursor will be at Bit 8 on the new mask. (Compare Figure 20-7 with Figure 20-6.)

To look for strings in transparent data in which the communications equipment inserts zero bits or DLE's, please see Section 46.

(b) "1 OF" Character Entry. Up to 16 characters may be entered from the same list as for strings. The trigger will take action upon receipt of the first character to match any one in the list. If Don't Care is used, only one character should be entered. If all characters are entered as Not Equal, a match is found on each character that is not any one of the characters entered.

20.6 DELAY UNTIL END OF FRAME

When YES is selected for DELAY EOF, the trigger will look for the string (or character) selected in the FOR field; if it matches the string, it then looks for the received block check calculation on the frame in which it found the match. If the block check is true, the trigger will consider the string received and will be true when any other conditions selected on that trigger are true. If the frame ends with a bad block check or is aborted, the string match will be considered not found, no actions will be taken, and the string search will begin again.

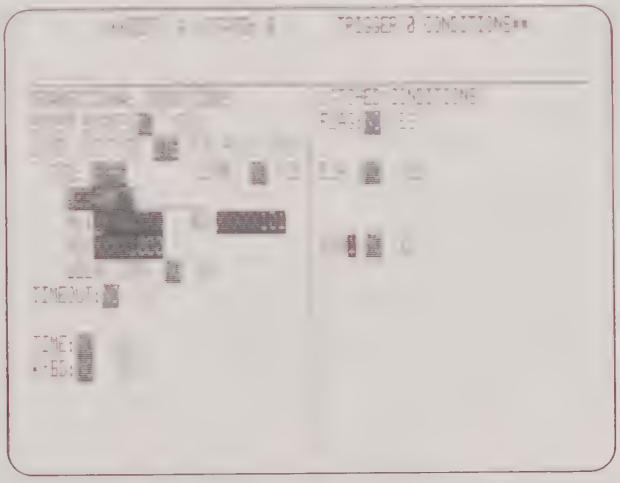


Figure 20-7

20.7 LINK

Triggers can be linked to increase the length of the string that a trigger will look for and the number of bit masks in a string, and to include BCC, "1 OF" characters, Frame, or Packet in the string.

When you select YES in the LINK field, the following trigger in numerical sequence is linked to the present trigger. If you wish, you may link all eight triggers in a state in succession, but you cannot link a trigger in one state to one in another state. The default selection is LINK:NO.

(a) Bit Masks in Linked Strings. When a trigger is LINKed, 16 more character positions including four more bit masks may be added to the string by entering them on the next trigger. To enter a fifth Bit Mask at the end of a string -- whether or not you have filled all 16 positions on one trigger -- select the Conditions menu for the linked trigger; that is, the next trigger in numerical order. Enter a bit mask at the first string position. Fill in the bit mask field and press the ENTER key to return to the string-entry line on this trigger. Complete your string here. The software will ignore any empty positions at the end of the string-entry line of the preceding trigger and add the linked string directly to the last character on the preceding menu. To return to the previous trigger conditions, press TRIG followed by its number and C.

(b) Strings of More than 16 Characters. If you wish to enter a string of more than 16 characters, when the string is full simply select LINK and then the next trigger Conditions menu, and use the string capacity of the linked trigger.

(c) "1 OF" Character in a Linked String. At any position in a linked string, you can insert a character that is one of a list of characters by linking the next trigger and selecting 1 OF on its Conditions menu. The trigger will look for the first character satisfying the character list at that position in the string. To add any more characters to the string after a "1 OF" character, you must link another trigger.

(d) Block Check Characters in a Linked String. A good or bad block check character (GDBCC or BDBCC) may be used only as the first character in a linked string. It will be the only string character on the Conditions menu; succeeding characters must be entered on the next linked trigger.

(e) Frame or Packet in a Linked String. Either Frame or Packet can be used in a linked string. Please see Section 46 for definitions of the strings triggers will look for in these cases.

(f) Linked Trigger Actions. When triggers are linked, actions are taken in stepwise, cumulative fashion, as shown in Figure 20-8. If Triggers 0, 1, and 2 are linked, then Trigger 0 actions will occur as soon as Trigger 0 is true; Trigger 1 actions will occur when Triggers 0 and 1 conditions are true, and Trigger 2 actions will occur only when Triggers 0, 1, and 2 conditions are true. Thus you may select actions on any linked trigger, but only those on the last linked trigger will result from the trigger seeing the entire string.

(g) Other Conditions on Linked Triggers. You may include other trigger conditions (EIA status, internal flag status, and so on) on any linked trigger. These other conditions will be tested when the string segment accumulated through that trigger comes true (see Figure 20-8).

20.8 TRIGGER STRING CAPACITY

The maximum COMSTATE II string capacity, whether or not triggers are linked, is determined by number of string sets. A string set consists of one of the following:

- The first eight or the second eight string positions on a trigger;
- A single "1 OF" character set;
- One FRAME or PACKET selection.

The maximum number of string sets that may be used simultaneously in the COMSTATE unit is 192. If more than 64 states are used, the maximum will be reduced, but it will not be below 128.

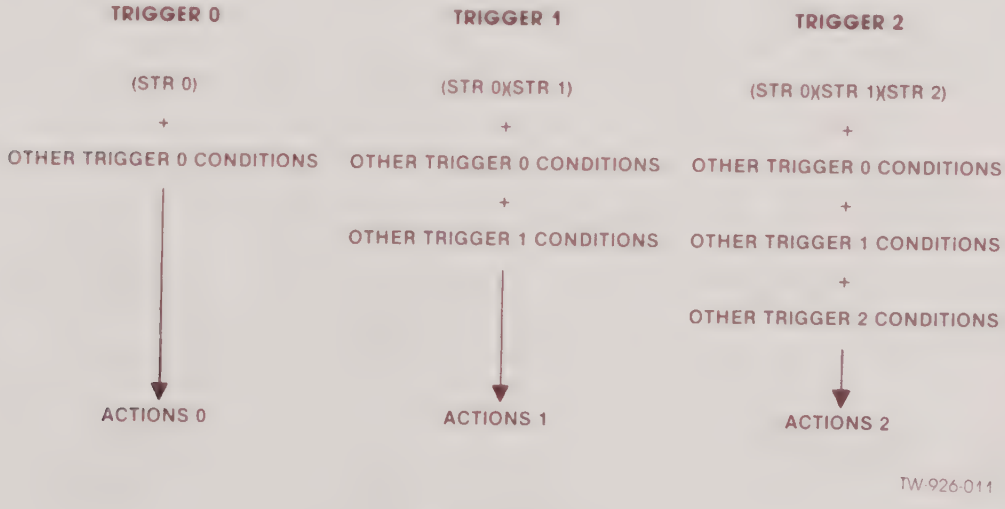


Figure 20-8

20.9 TIMEOUT

There are two timeout timers which can be set by triggers and monitored by other triggers (which need not be in the same state or Test).

The default selection is NO. When you select YES, the data selection field shown in Figure 20-9 appears. When 1 is selected, the trigger waits for timeout of Timer 1; when 2 is selected, it waits for Timer 2 to time out. When 1or2 is selected the trigger will monitor both timers and the condition will be true as soon as either one times out.

To set the timeout timers, see Section 21.8.

20.10 TRANSMISSION COMPLETE

The XMT CMPLT field appears only if you have selected one of the Emulate Modes on the Parameter 1 menu. The default choice is OFF. When YES is selected the trigger looks for the end of a transmission by the COMSTATE II. The XMIT CMPLT condition usually should be used with another condition to control when, or how many times, it will be tested. See Section 43.4 for more explanation of this condition.

20.11 TIME

The COMSTATE II has a real-time 24-hour clock, which can be verified and set using the Parameter 7 menu (see Section 23). The value of this clock can be used as a trigger condition. If the Time condition is selected during tape playback, the trigger will monitor the date-time stamping recorded on the tape instead of the real-time clock.

When you select YES for TIME the D/T field appears, as shown in Figure 20-10. This field is in the format dd/hhmm. It is used to select during what hours of the day and at what intervals within that period the trigger will be true. If you do not specify a date or time (no entry), the trigger will come true on every minute of every hour every day. This field may be used in two ways.

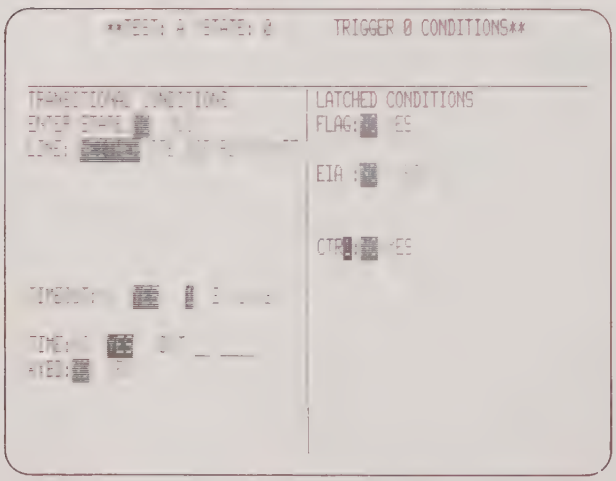


Figure 20-9

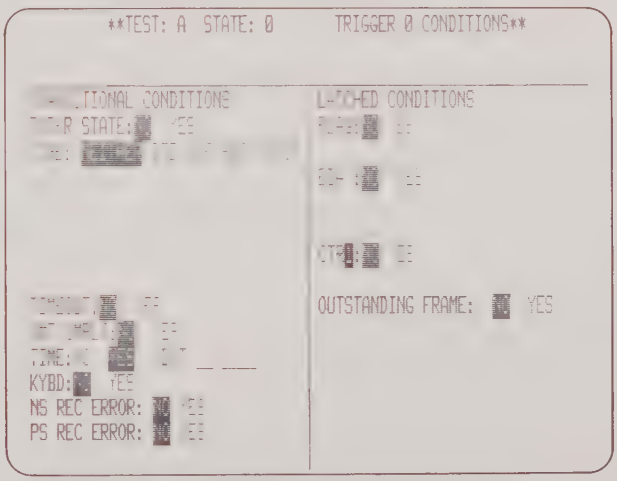


Figure 20-10

(a) As a Mask Field. Enter a period (.) at any position in the mask to represent a Don't Care character. Enter a number at any position in the field that you want to specify. The condition will be limited to all clock values that match the mask.

Examples:

dd/hhmm	Trigger condition true
D/T .0/....	Every minute of days 10, 20, 30 of every month
D/T 10/....	Every minute of day 10 of every month
D/T ../...0	Every 10 minutes of every hour of every day
D/T ../..00	On the hour every day
D/T ../18.0	Every 10 minutes between hours 18 and 19 every day

(b) To specify the day or time. In this method, no Don't Care entries are used, and spaces following an entry are ignored.

Examples (dashes represent blanks on the screen):

dd/hhmm	Trigger condition true
D/T 1_/____	On every minute of day 01
D/T __/5___	At hour 5 (0500) every day
D/T __/23__	At hour 23 (2300) every day
D/T __/231_	At 31 minutes past hour 2 (0231) every day

20.12 KEYBOARD

This condition allows you to manually control programs by assigning any key on the ASCII keyboard as a trigger condition. Select YES in the KYBD field and enter the desired key in the KEYS data-entry field. This is useful, for example, when you want manual control over when one or more states become active. You can assign a different key to initiate activity of each state (or group of states).

If a key not selected as a condition in the currently active state is operated, the alarm will sound and a key error prompt will be displayed.

20.13 NS REC ERROR

This condition (Figure 20-11) appears only in Emulate modes for BSC/X.25, 7E/X.25, SDLC, and SDLC/NRZI. It is true when the Number Sent Count Received does not equal the Number Sent Count Expected. The default choice is NO. See Section 49.11 for a more complete discussion of this condition.

20.14 PS REC ERROR

This condition (Figure 20-11) comes up only in Emulate Modes for BSC/X.25 and 7E/X.25. It monitors the packet sequence count in the same fashion as the preceding condition monitors the frame sequence count. Please see Section 49.11 for more about this condition.

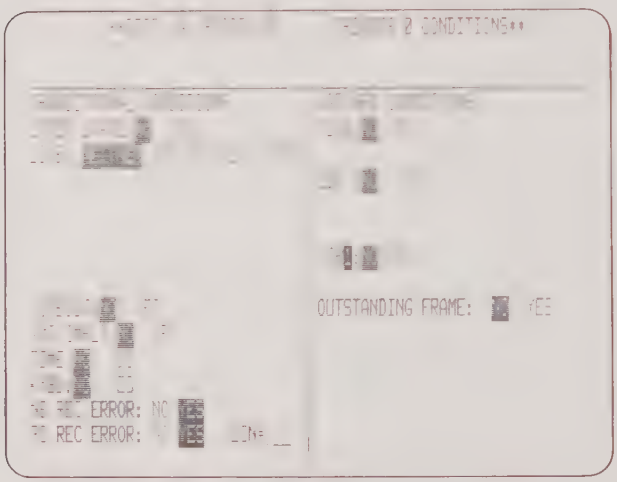


Figure 20-11

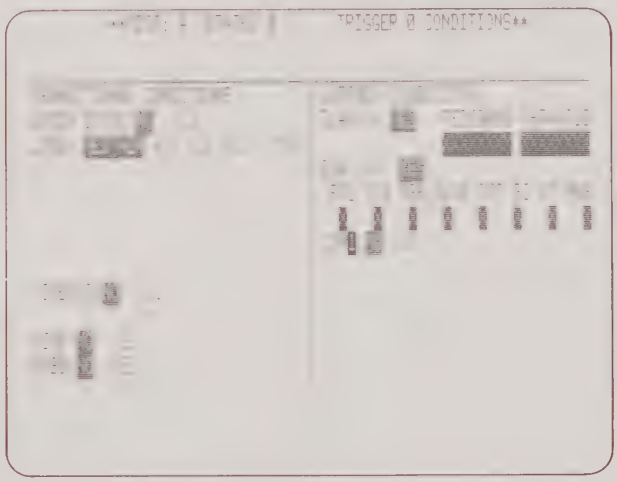


Figure 20-12

20.15 FLAG

There are 16 internal flags in the COMSTATE II and they all may be monitored by one trigger, or all set by one trigger, or monitored and set by any combination of triggers. The same flag may be sensed and set by the same trigger. If MAINTAIN is not selected (Parameter 4 menu), all flags are set to 0 when Run Mode is entered or if the RUN key is pressed while the unit is already in Run Mode. The condition of all flags is visible in each state while it is active. To test internal flags, select YES in the FLAGS field (see Figure 20-12). In the flag mask on the next line, enter a 1 to test for a flag ON, a 0 to test for a flag OFF, or X (or DON'T CARE key) for Don't Care.

If a FLAG condition is used with a string or character-type condition, then the flag is tested when the entire string has come true. The flag condition is not tested on each character of the string.

The COMSTATE II can store the states of the internal flags when it exits Run Mode. On the Parameter 4 menu (Section 40) select MAINTAIN for LEAD STATUS EXITING RUN. This allows you to interrupt the tests in progress by pressing the PROGRAM key, make changes in the program, and then resume the test. The program will continue from where it left off when the Run Mode was exited.

20.16 EIA

(a) Technical Guidelines. Select YES in the EIA field if you want a trigger to monitor status of up to seven RS-232/V.24 leads or to look for a Marker (see Figure 20-12). In using the EIA condition, you should keep the following three points in mind.

(1) If only EIA conditions are selected, the trigger will wait for all EIA conditions to be satisfied: it will become true upon the last transition necessary to satisfy these conditions. (If all conditions are true when a state is entered, the trigger will be activated once at that instant.)

(2) If a LINE condition, such as a string, is also selected, the trigger will be true if it sees the specified pattern of EIA lead status at the time the LINE condition is satisfied.

(3) For LINE:NEITHER, if other conditions are selected with EIA, the trigger will be true if the other conditions are true at the time of the last transition necessary to satisfy the EIA conditions.

(b) RS-232/V.24 Leads. Enter a 1 in the box under a lead to indicate ON; a 0 for OFF. No entry (X) is read as Don't Care. Entry fields are provided for six leads: RTS (Pin 4), CTS (Pin 5), DSR (Pin 6), DTR (Pin 20), RLSD (Pin 8), and RI (Pin 22). You may monitor a seventh RS-232/V.24 lead by strapping the desired lead and selecting STrap on the menu.

(c) Marker; Manual Program Control. When you select MKR, the trigger will sense the status of the ENTER key. This effectively gives you manual control of trigger actions, for the conditions will not be true until you press (select 1) or release (select 0) the ENTER key in Run Mode. See the KYBD condition (Section 20.12) for a greater range of manual control.

20.17 COUNTER

Here you may select one of eight statistical counters to be monitored by the trigger. (Counters are controlled from the trigger Actions menus; see Section 21.10.)

To use this condition, write over the counter number with the number of the counter you want to monitor; then select YES, which brings up a data selection field and a data-entry field. The data selections are

EQ	equal to (the default selection)
NE	not equal to
GE	greater than or equal to
LE	less than or equal to

Enter the counter value to be compared in the eight-character data-entry field at the right. The maximum counter value is 99,999,999.

20.18 OUTSTANDING FRAME

This selection (Figure 20-10) appears only in Emulate modes when BSC/X.25, 7E/X.25, SDLC, or SDLC/NRZI has been selected on the Parameter 1 menu. The default choice is NO. Select YES if you want a trigger action whenever there is an outstanding frame.

See Section 49.11 for a more complete discussion of this condition.

21 TRIGGER ACTIONS

Figure 21-1

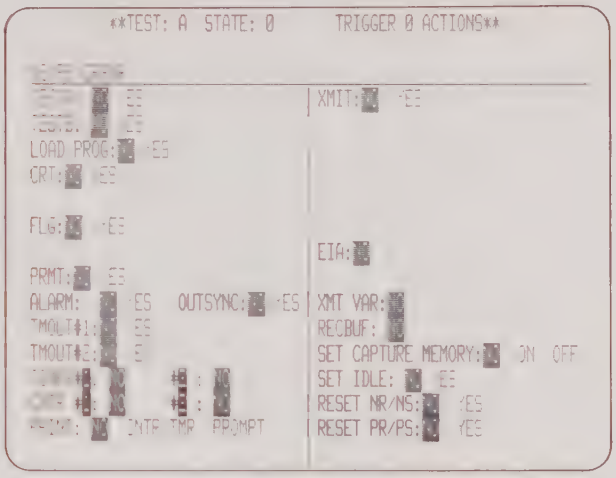


Figure 21-2

21
TRIGGER ACTIONS

21.1 INTRODUCTION

Figure 21-1 is a trigger Actions menu as it appears for default parameters; Figure 21-2 shows the same menu with all actions displayed.

Any combination of trigger Actions may be set to take effect when all conditions selected for that trigger are true. More than one trigger has access to the same action. For example, a counter may be used to count characters from DTE on one trigger and characters from DCE on another trigger. The counter will register the total number of characters on both leads.

When you select YES for a trigger action, the action criteria are presented. If you specify any criteria (for example, if you select TEST A: YES and fill in the GOTO field with the name of a state) and then select NO, the criteria you have selected will disappear from the display, but remain dormant in the unit. These choices will reappear if YES is again selected. If the program is recorded, the dormant choices will also be saved on the tape for future use. They will be cleared when the trigger is cleared or deleted.

At data speeds up to 19.2 kbps, all trigger actions occur within the next received character time. As the speed is increased up to 72 kbps, the number and complexity of triggers that can be used is reduced. Trigger efficiency is also influenced by the type of data.

Trigger timing and sequencing are explained in detail in Section 25; trigger function in high-speed operation is discussed in Section 44.

The second and third lines of each trigger Actions menu are a summary of the selections on the Trigger Conditions menu. This summary is explained in Section 24.

21.2 TEST A AND TEST B

These two selections control activity of other states, in either the same or the alternate test.

When YES is selected, two new fields appear: GO TO and ENable (see Figure 21-3). In the GO TO field, enter the name (or number) of the state that you want program activity to go to. If you use a name, be sure it has been entered on the correct State Test menu (Section 19.5) and that your trigger entry is an exact match.

The ENable selection allows you to control activity of the test. EN is a window field with default selection NC, or "No Change." If the target test has not been disabled, the EN:NC action will activate the test. If the test has been disabled by another trigger, then EN:NC means that it will remain disabled.

If EN:YES is selected, the target test will be activated whether or not it has been disabled.

If EN:DISable is selected, the test will be disabled until it is reenabled by a trigger with EN:YES selected.

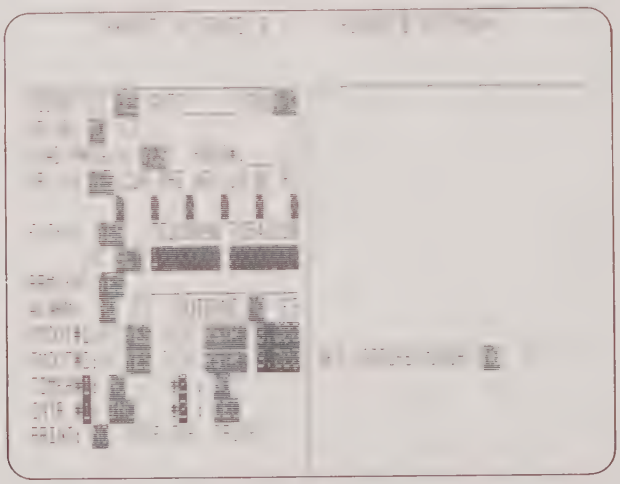


Figure 21-3

21.3 LOAD PROGRAM

LOAD PROG automatically loads a program from a Multiple-Program tape. When YES is selected a program number field appears (Figure 21-3). Select the program number from the tape Directory and enter it in this field as a three-digit number.

This action will overwrite both current tests with the designated program. In designing tests that include this action, remember to allow for the amount of time consumed by the program loading operation. Timeouts set in your system may limit use of this action.

21.4 CRT

Triggers can be used to selectively enhance or display specific data on the CRT. Control of the CRT is independent of the tape or counters or timers. Data withheld from the CRT while it is frozen is still available to be recorded and counted. The display window and the display buffer are controlled together, so no CRT data is stored in the buffer while the screen is frozen.

To turn a CRT action ON (see Figure 21-3), enter a numeral 1 in the corresponding box; to turn an action OFF, enter a zero (0). An X means that no action will be taken.

(a) Clear. When CLR is selected, the trigger clears the entire CRT display and the display buffer. The process takes 20 milliseconds, during which all received data is lost to the CRT display. CLEAR is automatically reset to OFF when the clearing process is complete, so it is not necessary to use another trigger to turn CLEAR off.

(b) Freeze. When FRZ is on, no new data is received by the CRT buffer or displayed until freeze is turned off. Freeze may be turned on or off by another trigger or manually. When a trigger freezes the display, the TRIGGER and FREEZE indicators on the status panel go on. If the display has been frozen or unfrozen manually, the MANUAL indicator will go on and TRIGGER LED will be off. Then trigger control can be restored only by operating the CRT CONT TRIG key.

(c) Hexadecimal. When HEX is enabled, all data received after the trigger is true is displayed in hexadecimal. Once data is received in the CRT buffer under trigger control as hexadecimal, it remains in hexadecimal.

(d) Low Intensity. LOw intensity is useful to display data of lesser importance. However, in combination with reverse image, it creates a highlight that is immediately noticeable.

(e) Blink. BLink is useful to call attention to small portions of data. In combination with reverse image it gives the most conspicuous highlight. Blink cannot be reset or overridden from the keyboard.

(f) Reverse Image. Reverse-imaged characters are presented in black on a white background. REVerse image is very effective when used in combination with low intensity, but difficult to read if used over a large area of the screen.

21.5 FLAGS

Flags are bits that can be set on or off and sensed by triggers. All flags can be seen by any active state in either Test A or Test B. The default selection is NO. When YES is selected, you are given two more choices, INC and SET (see Figure 21-3). The latter is the default selection.

(a) Specifying a Flag Mask. When SET is selected (see Figure 21-3), a mask of 16 numbered boxes appears at the right. Use the ENTER key to move the cursor to this field. Enter a 1 under the number of any flag, or flags, that you wish turned on; a 0 for any flag, or flags, you wish turned off. X means Don't Care: the trigger will not change the status of this flag. The trigger action will be to set the flags according to the mask you have entered. The initial flag status when the COMSTATE II enters Run Mode is all flags OFF.

(b) Incrementing the Flag Mask. INCrement is the alternate choice when YES is selected. Increment can be used to control recursive routines. Each time the trigger conditions are satisfied, the value of the mask consisting of Flags 0 through 7, considered as a binary number, will increment by one. To restart Flag Increment from zero, use the flag SET action (a).

NOTE: The INCrement action uses only Flags 0 through 7. The high-order bit is on the left (Flag 7); the low-order bit on the right (Flag 0). When the flag bits have incremented to 256, they will all be reset to zero on the next incrementation.

(c) Auxiliary Outputs. Flags F, E, and D cause outputs on pins 4, 9, and 11, respectively, of the auxiliary connector to change state, following the status of the flags. When the flag is set to 1, the output will be +3.5 volts and when the flag is set to 0, the output will be at ground. The output driver is a 74LS04, which can sink up to 8 mA. Ground on the connector is on pins 7, 8, 15, and 14.

21.6 PROMPT

PROMPT displays a message to the operator on the second line of the CRT data display. Prompts entered in Test A will appear on the left side of the line; prompts entered in Test B will appear on the right side of the line.

Selecting YES in the PROMPT field displays a 19-character data-entry field. You may use any ASCII characters in the Prompt, but hexadecimal entries and special keys are illegal. The prompt is not transmitted, but routed directly to the CRT. Display of Prompts is further described in Section 8.

In Run Mode, the Prompt is displayed until it is replaced by another prompt, or you clear it from the CRT by pressing the CLEAR FIELD key.

Prompts can be used to call your attention to certain occurrences, or to help you follow the course of a test as it sequences from state to state. Prompts are also useful in program development because you can use a Prompt to tell you when a trigger is true. You can use a real-time trace display of the prompts or of states and prompts to follow the course of a test. For information on these Trace displays, see Sections 8.4 and 8.5.

21.7 ALARM

The alarm is a multiple beep each time the trigger comes true. It is useful for calling your attention to the unit, especially when the situation of interest occurs infrequently. For example, the alarm can be set to sound whenever data is frozen on the CRT for analysis. If you select YES, the alarm is sounded when the trigger comes true.

Usually, if the alarm is set in more than one state, it should have the same source in each state to prevent confusion. Otherwise, each alarm should be accompanied with an identifying prompt.

21.8 OUTSYNC

When OUTSYNC:YES is selected, the DCE (RD) or DTE (TD) receiver, whichever is selected on the trigger Conditions menu, goes out of synchronization from trigger true until it sees the next synchronization pattern. While the receiver is out of synchronization, no data from that side of the line is presented to the display or to the counters and timers. However, the data is still recorded because there are separate receivers for the Capture Memory.

> NOTE: When you use any condition with an OUTSYNC action, you must specify which side of the line is to go out of synchronization by also selecting LINE:DTE or DCE and STRG. Do not enter any characters in the STRG data-entry field.

This ability is useful when the information after a header group is of no interest, but you need to see data on the other side of the line. In this case, Freeze would not be applicable since it inhibits addition of all data to the display.

21.9 TIMEOUTS #1 AND #2

COMSTATE II has two timers dedicated to the timeout function; that is, they may be set to increment only up to a predetermined value and their final readings may be used as trigger conditions. The default selection is NO. For YES, a data selection field and a data-entry field appear (see Figure 21-3).

RESTART: If RSTRT is selected, when the trigger is true the timeout timer is reset to 0 and begins to increment.

STOP: When STOP is selected, the trigger stops the timer, and the timeout does not occur. If Timeout is selected as a trigger condition, the condition will not become true in this instance.

The duration of the timeout is entered in seconds in the 5-character data-entry field at the right. The timeout timers increment in milliseconds. The data-entry field defaults to 3.000 seconds, and you may write over the default value with any number from 0.001 to 65,535. Although the maximum value for a single timeout is 65,535 seconds (18.204166 hours), it is possible to obtain longer timeouts by using the flags to look for multiple occurrences of the timeout. The maximum is 256 X 65,535 seconds or approximately 4660 hours.

Both timeout timers are visible to the triggers in any active state so each may be set by one state and read by another.

21.10 TIMERS

The COMSTATE II has four statistical timers. Any two timers can be controlled by one trigger. Each timer may be controlled in any active state. (Timers may not be tested, but separate timeout timers are also available. See Section 21.10.)

To select Timer 3 or 4, write over the default timer number with 3 or 4 (compare Figure 21-4 with Figure 21-3). The default selection is NO. When YES is selected for a timer, three more choices are available:

ReSTaRT causes the selected timer to reset to 0 and begin counting. Before a timer is reset by a trigger, the current value is transferred to the LAST column on the Counters and Timers display.

STOP causes the timer to stop. The timer value will be displayed in the CURRENT column of the Counters and Timers display until the next ReSTaRT or CONTinue takes effect or you intervene manually. (Timers can be reset manually using the KYBD trigger condition; see Section 20.12.)

CONTinue causes a timer to begin counting by adding to the existing count.

The maximum value for each timer is 65,535 (milliseconds or seconds, depending on the time base selected on the Statistics Menu; see Section 22). When this is exceeded, the CURRENT value will blink.

Figure 21-4

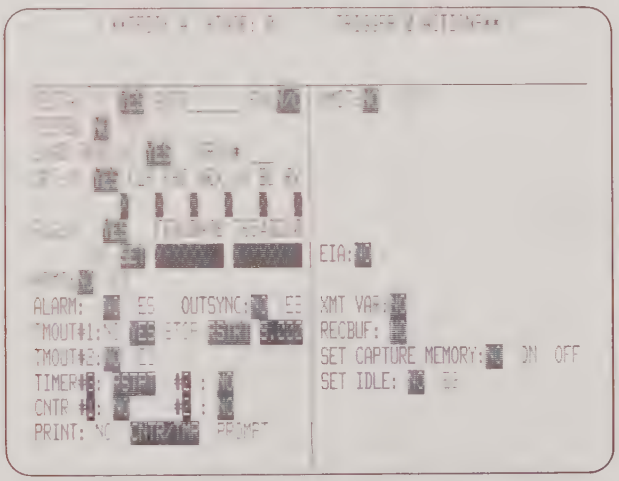


Figure 21-5

Timer resolution is selected on the Statistics (Parameter 6) menu (see Section 22) as seconds or milliseconds. The timers may also be named on the Statistics menu.

NOTE: When 1 second is used for the count increment and the durations are less than 1 second, a rounding effect occurs, where some shorter periods are missed and others counted. This effect will usually average out for counts above 100. Since the 1-second timebase runs continuously and is not initialized for each measurement, the accuracy of measurements will always be plus or minus 1 second.

NOTE: Remember that in playback mode, the timer readings are valid only if the data is played back at the original line speed. Otherwise, a correction must be made: for instance, 2 msec at 4800-bps line speed is equivalent to 1 msec at 9600-bps playback speed.

21.11 COUNTERS

There are eight statistical counters. All counters are accessible in any active state. Each trigger can set any two counters, and several triggers in the same state or in different states can control the same counter. The default selections are Counters 1 and 2, NO. You may select any of the other counters by writing over the default counter number (see Figure 21-4). When YES is selected, three choices are available.

INC. The menu defaults to INCrement because this is the most often used selection. Each trigger occurrence adds 1 (one) to the counter.

DEC. When DECrement is selected, each trigger occurrence subtracts 1 (one) from the counter value.

RESET sets the counter to 0 (zero). Whenever a counter is reset by a trigger, the current count is transferred to the LAST column of the Counters and Timers display.

The maximum count for each counter is 99,999,999; the minimum is 0. When either limit is passed, the current value will blink. Counters may be named on the Statistics (Parameter 6) menu (see Section 22). Counters can be reset manually using the KYBD trigger condition; see Section 20.12.

Counter readings can be used as trigger conditions (see Section 20.17). Example: a trigger could be set to increment Counter 2 each time Counter 1 reaches 99,999,999, allowing Counter 2 to count by 99,999,999's.

21.12 STATISTICAL PRINTOUTS

The PRINT selections (Figure 21-5) allow you to print out either counter and timer statistics or program Prompts (messages to the operator).

The CNTR/TMR action will automatically log current or last values of seven counters and timers. The counters and timers to be printed must be selected on the Statistics Menu (Parameter 6; Section 22). This action is especially useful in conjunction with the trigger TIME condition (Section 20.11).

The PROMPT action prints, with a date-time stamp, the prompt being displayed by the trigger on which it is selected. This allows you to select

which prompts you want printed. (The Prompt Trace display, which includes all prompts, can also be printed.)

Instructions for using a printer with the COMSTATE II and examples of printouts are in Section 38.

21.13 TRANSMIT

All transmissions are controlled by the trigger action XMIT. Here you select the message content and control the block check transmission. Information about transmitting is gathered together in Sections 39 through 43.

21.14 MESSAGE FLOW

This selection is only valid in asynchronous mode. When YES is selected, the trigger can SUSPEND or CONTinue a transmission initiated by another trigger. Please see Section 43.2 on interactive operation for a complete discussion.

21.15 EIA LEAD CONTROL

Select YES to allow the trigger to independently control the interface leads that are driven by COMSTATE II in the MODE selected on the Parameter 1 menu. Please see Sections 40 and 43.3 for a complete discussion of interface lead control.

21.16 TRANSMIT VARIABLE

This field appears on the trigger menu only when one of the Emulate Modes has been chosen on the Parameter 1 menu. The XMIT VAR field controls one of four 1-byte counters whose output can be transmitted by triggers. A trigger can cause the value of one of these transmit variables to be incremented or set. See Section 42.6 for a complete explanation.

21.17 RECEIVE BUFFER

This field also appears only when an Emulate Mode has been chosen. Select RESTART to clear a receive buffer and begin storage of data. Select STOP to stop storage of data in a receive buffer. Designate buffer X or Y in the field to the right. When STOP is selected, an additional field appears at the far right of the line. Type in 0 to 9 after the minus sign to indicate how many bytes are to be truncated at the end of the receive buffer. Section 42.4 explains how to load the two Receive Buffers with received data and then transmit their contents.

NOTE: Only one receive buffer should be receiving data at a time. Select RESTART for only one buffer at a time.

21.18 CAPTURE MEMORY

This selection starts (ON) and stops (OFF) data recording (or playback). All other recording parameters are controlled from the Parameter 2 menu. See Section 33 for a complete discussion of data recording.

21.19 SET IDLE

The SET IDLE field (see Figure 21-2) appears when SYNC or BSC/X.25 has been selected on the Parameter 1 menu along with an emulate mode. SET IDLE allows you to specify what idle line condition will be applied by the COMSTATE II in Emulate modes. If you select SET IDLE: YES, another selection, NEW IDLE, will appear. Alphanumeric characters, control characters, or hexadecimal characters are legal in this field.

This trigger action is useful for tests in X.21 or X.21 BIS, when you may wish to repeat continuously a single character such as PLUS (+) or NULL, then change this string in response to a new input.

The SET IDLE field is valid only in Emulate modes, and only for synchronous formats.

21.20 RESET NR/NS

This selection appears only when an Emulate Mode has been selected on the Parameter 1 menu in conjunction with one of the following formats: BSC/X.25, X.25, SDLC, or SDLC/NRZI. Select YES to reset both NR and NS to zero (number of next-received frame and number of frames sent) prior to the next COMSTATE II transmission. See Section 42.7 for additional information.

21.21 RESET PR/PS

This selection also appears only when an Emulate Mode has been selected on the Parameter 1 menu and only in conjunction with the following formats: BSC/X.25 and X.25. Select YES to reset PR and PS to zero (number of next-received packet and number of packets sent). Then indicate the LCN for which packet sequence numbers are to be reset. (If the LCN field is left blank, the COMSTATE II will reset these numbers for the LCN of the next received packet.) See Section 42.8 for further information.

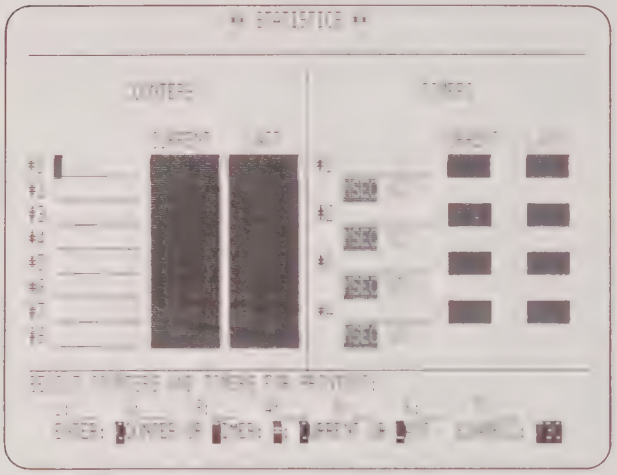


Figure 22-1

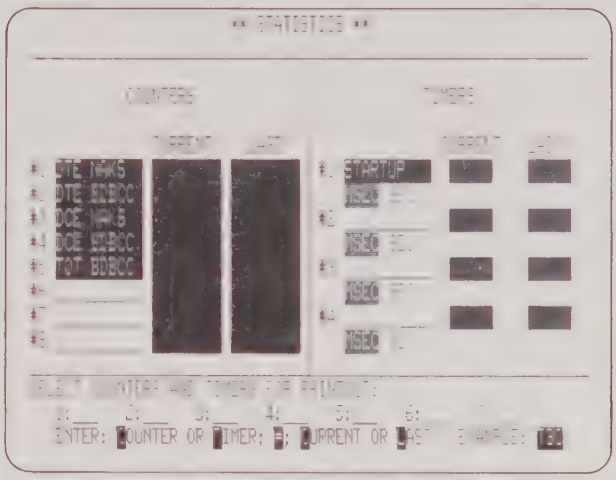


Figure 22-2

22
STATISTICS MENU

The Statistics menu, which is the Parameter 6 display (Figure 22-1), has three uses: (1) assigning names to the eight counters and four timers; (2) selecting the timebase for each timer; and (3) selecting counters and timers for the trigger Print action. The CURRENT and LAST fields are not entry fields; they are active only in Run Mode.

You may enter a descriptive name or function for each counter or timer. This name will appear on the real-time Counters and Timers display in Run Mode. The name can consist of up to 10 alphanumeric and control characters. Hexadecimal entries are not permitted.

The timebase for each timer may be selected separately as either milliseconds (the default selection) or seconds. Name the timer on the data-entry line above the timebase selection.

NOTE: In Run Mode, the slate blue CNTR-TMR key obtains this same display, but with real-time counter and timer readings displayed (see Section 9.5).

At the bottom of the display is a line of data-entry fields in which you can specify seven counters and timers to be logged by the trigger PRINT action (see Section 21.18). In each field you enter, in sequence, three characters: (1) C or T for counter or timer, (2) the number of the counter or timer, and (3) C or L, for Current or Last. The third character determines whether the result printed will be the current value or the last value before the counter or timer was reset by a trigger. The PRINT action cannot function unless at least one of these fields is filled in. Figure 22-1 shows the default menu; Figure 22-2 shows some sample entries.

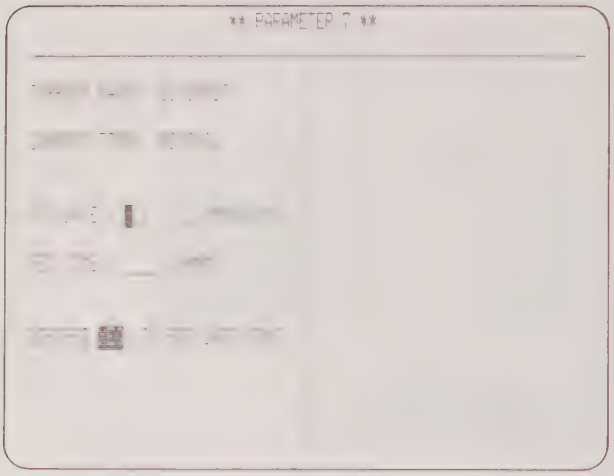


Figure 23-1

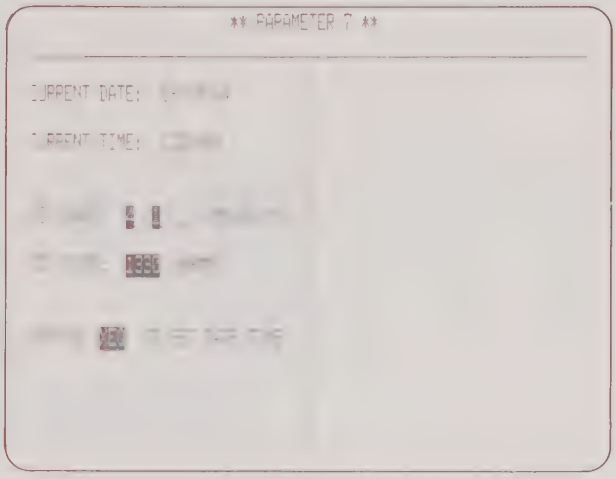


Figure 23-2

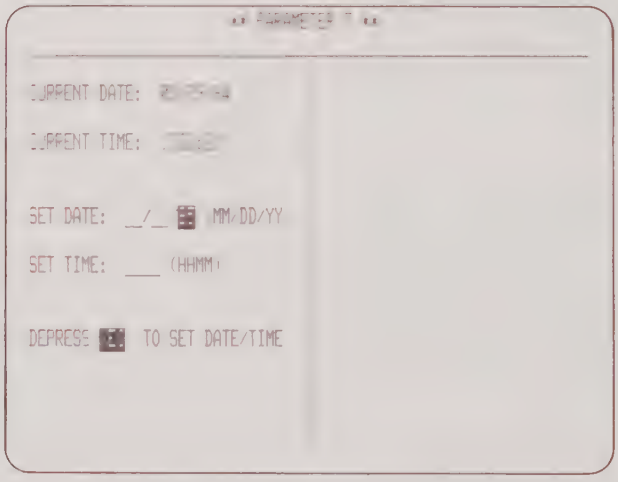


Figure 23-3

23
THE REAL-TIME CLOCK

The COMSTATE II has a real-time clock. Values of the clock may be used as trigger conditions by selecting TIME on the trigger conditions menus (see Section 20.11). To set the clock, display the Parameter 7 menu (see Figure 23-1). The Current Date and Current Time -- to the nearest second -- are displayed at the top of the first column.

The SET DATE line consists of three fields, month, day, and year. The ENTER key moves the cursor to each field. The month and day entries may be either one or two digits; it is not necessary to enter a leading zero for a number below 10. If you enter only a partial date -- just the day, for instance -- only that portion of the date will be reset.

In the SET TIME field, spaces are illegal and the RIGHT arrow key will not move the cursor out of a blank character position. Therefore, all four number positions in the field must be filled.

Figure 23-2 shows the menu filled out for April 1, 1984 and 1:30 p.m. Figure 23-3 shows the menu set up to reset only the year.

To set the clock, press the XEQ key when the current date and time equal the selected date and time. XEQ is illegal if the SET TIME field is not filled with four numbers.

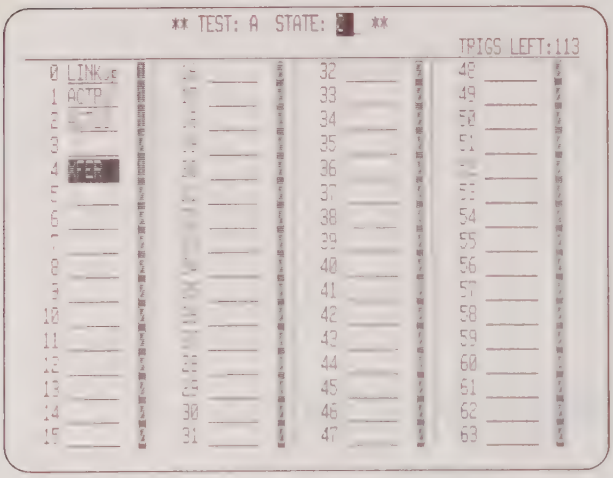


Figure 24-1

Figure 24-2

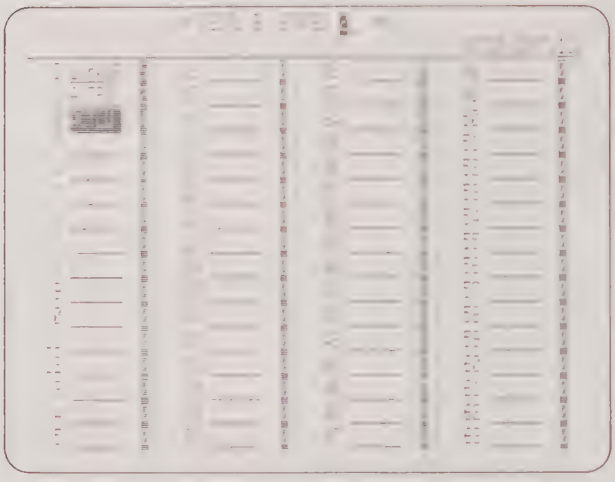


Figure 24-3

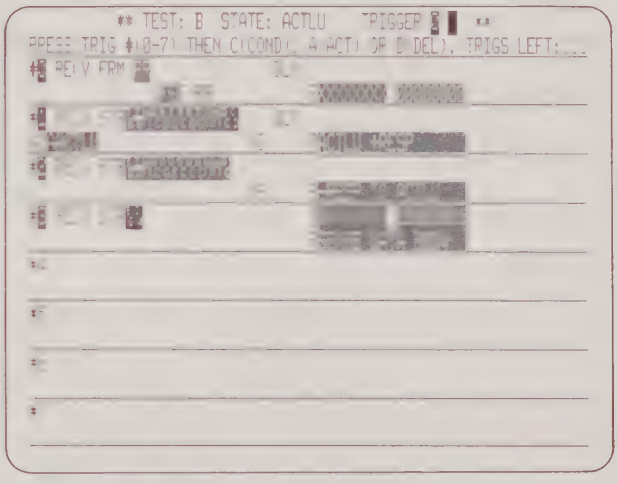


Figure 24-4

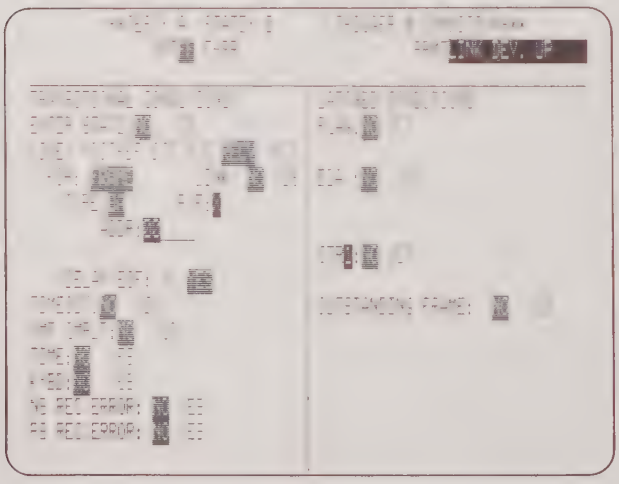


Figure 24-5

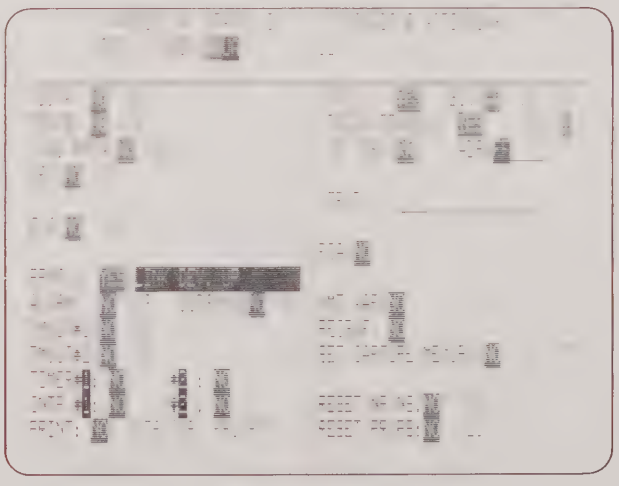


Figure 24-6

24
THE TRIGGER MENU SUMMARIES

24.1 TRIGGER SUMMARY

A Trigger Summary display for each state within either Test may be seen by first pressing the STATE TEST A or STATE TEST B key to display the appropriate Test Menu (see Figures 24-1 and 24-2). To select a particular Trigger Summary, enter the number of the appropriate state in the header line of the Test Menu (Figure 24-3). Now press TRIG to display the Trigger Summary for the state.

Figure 24-4 shows the Trigger Summary for ACTLU State (State 2) of Test B. Test and State are identified in line 1. To display or delete a particular trigger, you can enter the desired number in the Trigger data-entry field in the header, followed by C (for Conditions), A (for Actions), or D (for Delete). Line 2 of the header contains these instructions.

The summary for Trigger 0 is identified by #0 at the left; that for Trigger 1 by #1, and so forth. For each trigger, the first line summarizes the Conditions menu and the second line summarizes the Actions menu. Entries appear on the Summary only if YES is selected on the menu. The entries on the Summary are not in the same order as they appear on the trigger menu.

The abbreviations used on the Trigger Summary are defined in Tables 24-1 and 24-2.

24.2 CONDITIONS SUMMARY

Figures 24-5 and 24-6 are the Conditions and Actions menus for the same trigger. Lines 2 and 3 of Figure 24-6 summarize the Conditions menu shown in Figure 24-5. The abbreviations used are defined in Table 24-1.

24.3 ACTIONS SUMMARY

Lines 2 and 3 of the Conditions menu summarize the Actions menu, as shown in Figure 24-5. Table 24-2 defines the abbreviations used on this summary.

TABLE 24-1
TRIGGER CONDITIONS MNEMONICS

Trigger Menu	Conditions Summary	Trigger Summary
ENTER STATE: NO	No entry	No entry
ENTER STATE: YES	ENTR ST	ENTER STATE
NEITHER	No entry	No entry
DTE	DTE	DTE
DCE	DCE	DCE
RECV	RECV	RECV
XMIT	RXMT	RXMT
LINK: NO	No entry	No entry
LINK: YES	LNK	LNK
STRG	STRG [ ]	S [ ]
M (Bit Mask)	M (Low intensity)	M
1 OF	1 OF [ ]	1 [ ]
PARER	PARER	PARER
GDBCC	GDBCC	GDBCC
BDBCC	BDBCC	BDBCC
FRAME	F	FRM
INFO	INFO	INFO
RR	RR	RR
RNR	RNR	RNR
REJ	REJECT	REJ
SREJ	SREJ	SREJ
SARM/DM	SARM/DM	SARM/DM
SABM	SABM	SABM
DISC/RD	DISC/RD	DISC/RD
UA	UA	UA
FRMR	FRMR	FRMR
TEST	TEST	TEST
XID	XID	XID
SNRM	SNRM	SNRM
UI	UI	UI
SIM/RIM	SIM/RIM	SIM/RIM
UP	UP	UP
CFGR	CFGR	CFGR
BCN	BCN	BCN
OTHER__	OTHER [ ]	OTHER [ ]
ADDR:__	ADDR: [ ]	No entry
P/F:[ ]	No entry	No entry
PACKET	P	PKT
DATA	DATA	DATA
RR	RR	RR
RNR	RNR	RNR
REJECT	REJECT	REJ
INT	INT	INT
INT CNF	INT CNF	INT CNF
DIAG	DIAG	DIAG
OTHER__	OTHER [ ]	OTHER [ ]

TABLE 24-1 (continued)

Trigger Menu	Conditions Summary	Trigger Summary
RSTRT C	RSTRT C	RSTRT C
RSTRT R	RSTRT R	RSTRT R
RESET C	RESET C	RESET C
RESET I	RESET I	RESET I
CLEAR C	CLEAR C	CLEAR C
CLEAR R	CLEAR R	CLEAR R
CALL AC	CALL AC	CALL AC
CALL RQ	CALL RQ	CALL RQ
LCN:___	LCN:[ ]	No entry
QDM:[ ]	No entry	No entry
ABORT	ABORT	ABORT
DELAY UNTIL EOF: NO	No entry	No entry
DELAY UNTIL EOF: YES	DLY	DLY
TIMEOUT NO	No entry	No entry
TIMEOUT YES	TMO_	TIMEOUT_
XMT CMPLT NO	No entry	No entry
XMT CMPLT YES	XCMPL	XMIT COMPLETE
TIME NO	No entry	No entry
TIME YES	TIME	TIME
D/T __/____	[ ]/[ ]	[ ]/[ ]
KYBD NO	No entry	No entry
KYBD YES	KYBD	KEYBOARD
KEYS = _	_	_
NS REC ERROR NO	No entry	No entry
NS REC ERROR YES	NS ERROR	NS REC ERROR
PS REC ERROR NO	No entry	No entry
PS REC ERROR YES	PS ERROR	PS REC ERROR
LCN:___	No entry	No entry
FLAG NO	No entry	No entry
FLAG YES	FLG: [ ] [ ]	F[ ] [ ]
EIA NO	No entry	No entry
EIA YES	EIA:[ ]	E[ ]
CTR_	CTR_	C_
EQ	=	=
NE	/	/
GE	>	>
LE	<	<
OUTSTANDING FRAME NO	No entry	No entry
OUTSTANDING FRAME YES	OFRM	OFR

TABLE 24-2
TRIGGER ACTIONS MNEMONICS

Trigger Menu	Actions Summary	Trigger Summary
TESTA(B): NO	No entry	No entry
TESTA(B): YES		
GOTO_____	GOA(B) [ ]	GOA(B) [ ]
EN:		
N/C	No entry	No entry
YES	EN	EN
DIS	DI	DI
LOAD PROG: NO	No entry	No entry
LOAD PROG: YES	LOAD PROGRAM	LOAD PROGRAM
PROG#:___	[ ]	[ ]
CRT: NO	No entry	No entry
CRT: YES	CRT [ ]	CRT [ ]
FLG: NO	No entry	No entry
FLG: YES		
INC	FLAG INCR	FLAG INCR
SET	FLG [ ] [ ]	F [ ] [ ]
PRMT: NO	No entry	No entry
PRMT: YES _____	PRMT [ ]	P [ ]
ALARM: NO	No entry	No entry
ALARM: YES	ALRM	A
OUTSYNC: NO	No entry	No entry
OUTSYNC: YES	~~SY~~	~~SY~~
TMOUT#_: NO	No entry	No entry
TMOUT#_: YES	TMOUT-	TO
STOP	S	S
RSTRT _____	R	R
TIMER#_: NO	No entry	No entry
TIMER#_: YES	TMR-	T_*
RSTRT	R	R
STOP	S	S
CONT	C	C
CNTR#_: NO	No entry	No entry
CNTR#_: YES	CNTR-	C_*
INC	I	I
DEC	D	D
RES	R	R

(continued)

TABLE 24-2 (continued)

Trigger Menu	Actions Summary	Trigger Summary
PRINT: NO	No entry	No entry
PRINT: CNTR/TMR	PRTC/T	PS
PRINT: PROMPT	PRTPMT	PP
XMIT: NO	No entry	No entry
XMIT: YES	XMT	X
BCC: GD	No entry	No entry
BCC: BD	No entry	No entry
BCC: NO	No entry	No entry
BCC: AB	No entry	No entry
BEGIN FRAME: NO	No entry	No entry
BEGIN FRAME: YES		
FR TYPE:		
INFO	No entry	No entry
RR	F=RR	F=RR
RNR	F=RNR	R=RNR
REJ	F=REJ	F=REJ
SREJ	SREJ	SREJ
SARM/DM	SARM/DM	SARM/DM
SABM	SABM	SABM
DISC/RD	DISC/RD	DISC/RD
UA	UA	UA
FRMR	RMR	RMR
TEST	TEST	TEST
XID	XID	XID
SNRM	SNRM	SNRM
UI	UI	UI
SIM/RIM	SIM/RIM	RIM/SIM
UP	UP	UP
CFGR	CFGR	CFGR
BCN	BCN	BCN
OTHER__	OTHER ☐	OTHER ☐
ADR__	☐	☐
P/F:0	No entry	No entry
P/F:1	No entry	No entry
P/F:L	No entry	No entry
PK TYPE:		
DATA	DATA	DATA
RR	P=RR	P=RR
RNR	P=RNR	P=RNR
REJECT	P=REJ	P=REJ
INT	INT	INT
INT CNF	INT CNF	INT CNF
DIAG	DIAG	DIAG
OTHER__	OTHER ☐	OTHER ☐

(continued)

TABLE 24-2 (continued)

Trigger Menu	Actions Summary	Trigger Summary
RSTRT C	RSTRT C	RSTRT C
RSTRT R	RSTRT R	RSTRT R
RESET C	RESET C	RESET C
RESET I	RESET I	RESET I
CLEAR C	CLEAR C	CLEAR C
CLEAR R	CLEAR R	CLEAR R
CALL AC	CALL AC	CALL AC
CALL RQ	CALL RQ	CALL RQ
NO PAKT	XMT [ ] INFO	X [ ] I
LCN: [ ]	[ ]	[ ]
QD: __	No entry	No entry
TEXT : _____	[ ]	[ ]
MSG FLOW: NO	No entry	No entry
MSG FLOW: YES	MSG FLOW	MSG FLOW
SUSPEND	S	S
CONT	C	C
EIA: NO	No entry	No entry
EIA: YES	EIA [ ]	EIA [ ]
XMT VAR: NO	No entry	No entry
XMT VAR: _INC	V_INC	_I
XMT VAR: _ [ ]	V_S [ ]	_S
RECBUF: NO	No entry	No entry
RECBUF: YES	RBUF	RB
RSTRT		
X	XR	XS
Y	YR	YS
STOP		
X - [ ]	*	*
Y - [ ]	*	*
SET CAPTURE MEMORY: NO	No entry	No entry
SET CAPTURE MEMORY: ON	CM	CM
SET CAPTURE MEMORY: OFF	~~CM~~	~~CM~~

25 TRIGGER TIMING AND SEQUENCE

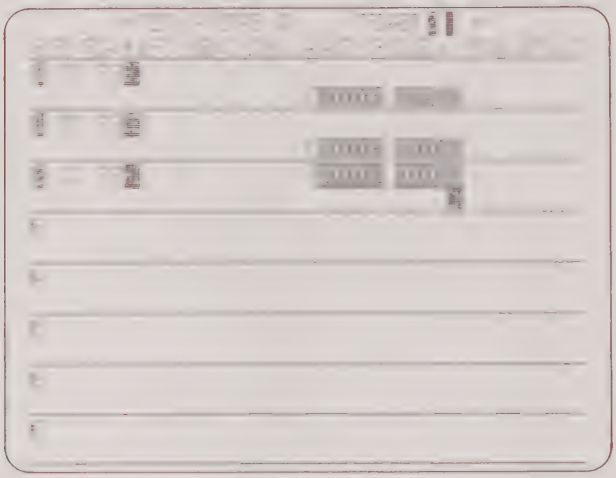


Figure 25-1

25
TRIGGER TIMING AND SEQUENCE

Although all triggers in a state are simultaneously active, there is an order in which they are processed. The order of trigger processing is significant only in special situations.

25.1 ORDER OF PROCESSING

Basically, all triggers in a state are first evaluated in order (0 through 7) for their conditions to be true; then the trigger actions are taken in order (0 through 7). This process permits the same internal flag to be sensed and set by the same trigger.

The sequence that occurs after each character is received is as follows:

(1) Evaluate triggers that do not look for data.

(2) Evaluate triggers that look for DTE data.

(3) Evaluate triggers that look for DCE data.

(4) Set all actions applicable for each trigger in order (0 through 7).

25.2 EXAMPLES

Usually the timing described in Section 25.1 is not important. However, under certain circumstances, such as when internal flags are being set and tested, these timing relationships are significant.

Consider the case in which a string on the DTE line sets a flag; another DTE string resets the flag; and that flag in conjunction with a DCE string turns on the tape. Figure 25-1 shows the Trigger Summary for this example. Trigger 0 looks for a string, BC, on the DTE side of the line and turns Flag F ON when the string is found. Trigger 1 looks for a string, DE, on the DTE side and turns Flag F OFF when the string is found. Trigger 2 looks for Flag F to be ON in conjunction with a DCE string of HI and turns ON the tape when this condition is met.

Suppose that the following data is received and shown in dual-line display on the CRT:

```
DTE -- A B C D E F
DCE -- G H I J K L
```

Before we consider what the program of Figure 25-1 will do with this data, we must understand how this data may have been received. First, the time correlation between the DTE and DCE lines on the display is accurate to ±1 character. Second, the display has a resolution, at the very best, of only one character. Thus, the two lines may actually be skewed by as much as seven bits in an eight bit frame, but this cannot be shown on the display. Third, the program processes characters within microseconds after they are received. Thus, two characters that appear on the screen to have been received simultaneously may not have been treated that way by the program.

Our sample program is looking for a string of BC on the DTE line and HI on the DCE line. On the display, these characters appear to have been received simultaneously, but actually string BC may have been received (1) before, (2) after, or (3) simultaneously with string HI. We now consider what action would be taken in each of the three cases.

(1) BC String Received before HI String: The Trigger 0 conditions and actions are processed before the Trigger 2 conditions and actions. Thus, when BC is received, Flag F is turned ON. When HI is received Flag F is already ON and the Trigger 2 conditions are met, so the tape is turned ON.

(2) BC String Received after HI String: Trigger 0 conditions and actions are processed after the Trigger 2 conditions and actions. Thus, when the HI string is received, Flag F has not yet been turned ON and the Trigger 2 conditions are not met, so the tape is not turned ON.

(3) BC and HI Strings Received Simultaneously: For this case, we must consider the trigger timing discussed in Section 25.1. Remember that all trigger conditions are tested before any of the actions are taken. First, the string BC on the DTE line is checked and found to be true, but no action is taken yet. Next, the string HI on the DCE line is evaluated, but since the Trigger 1 action has not yet been taken, Flag F has not been turned ON and the Trigger 2 conditions are not met.

Now that all of the conditions have been evaluated, the actions will be taken. The Trigger 0 condition having been met, the Trigger 0 action is taken first, so Flag F is now turned ON. Because the Trigger 2 condition has not been met, the Trigger 2 action is not taken, so the tape is not turned ON. In this case, even though Flag F has been turned ON, the tape is not, because the flag was not turned ON until after the Trigger 2 condition was tested.

Thus we see that for the same CRT display two different actions may be taken by the program. This is due to the resolution limitations of the CRT. The program is executing within microseconds of receiving each character and with much better resolution than is possible on the CRT.

26 CONSTANTS

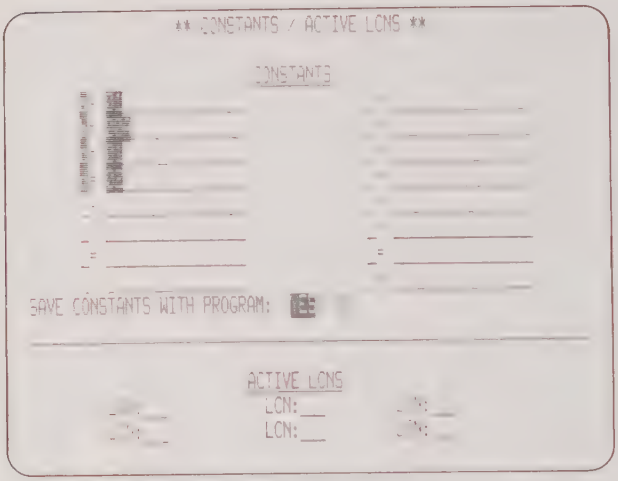


Figure 26-1

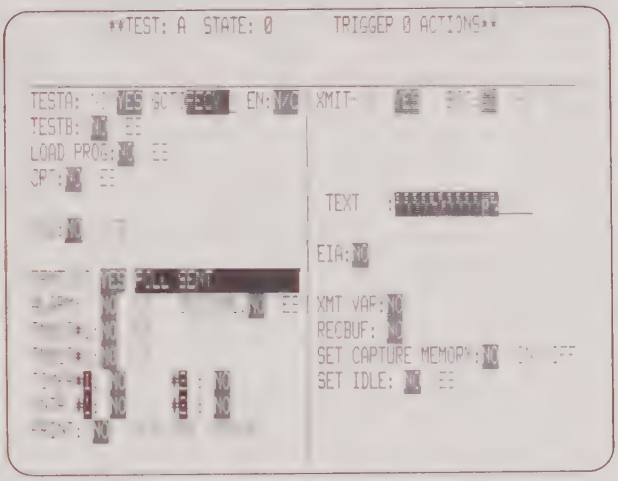


Figure 26-2

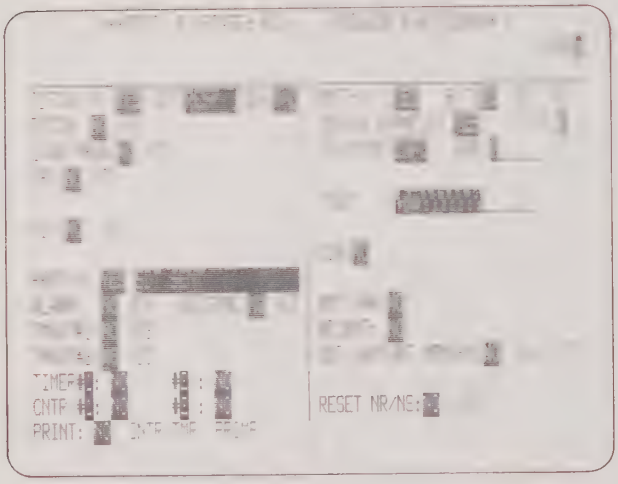


Figure 26-3

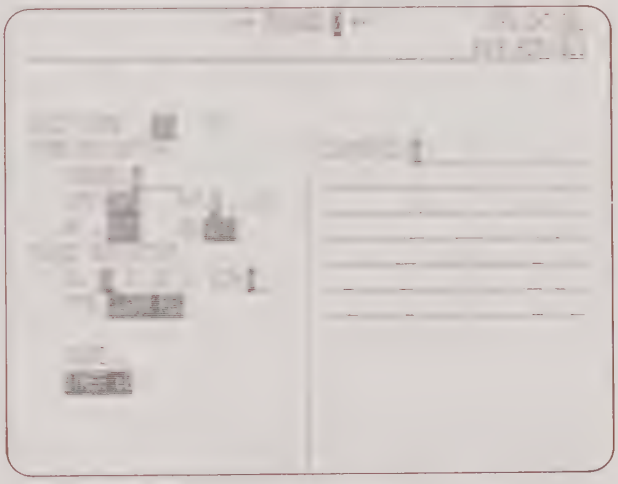


Figure 26-4

26
CONSTANTS

A constant is a lower-case character that is entered and defined on the Parameter C menu (see Figure 26-1) as an arbitrary string of characters. The constants may then be used in any of several places on a trigger screen or message buffer screen.

Once it is defined, this string of (one or more) characters is "constant" in the sense that it cannot be changed while a test is being run. Constants are typically used to specify frame addresses, packet LCNs, or timeout durations where a single change on the Parameter C menu will effect numerous changes in a test program.

Table 26-1 lists the fields on the COMSTATE II menus that accept constants.

Constants share the Parameter C screen with the ACTIVE LCNS menu. Active LCNs are discussed in Section 49.10 of this manual.

26.1 DEFINING CONSTANTS

Enter one constant per line on the Parameter C screen. The constant is entered to the left of the equal sign (=) as a lower-case "a" through "z." (It is not necessary to use the ALT key in this case.)

Define the constant in the field to the right. Alphanumeric characters, control characters, hexadecimal values, or other constants can be entered in this field. A string of one to 16 characters can be used. Define the constant just as you would in the menu field where the constant is used. For example, if the constant is filling a two-place address field, enter a two-place number as the Paramter C definition. If, however, the constant is replacing a hexidecimal string of text on a trigger menu, fill in the definition using the HEX key.

26.2 CONSTANTS ON ENTRY SCREENS: ALT-"a-z"

Enter a constant on a trigger screen or message buffer screen by pressing ALT and then any lower-case character from "a" through "z." The constant will be displayed in low-intensity reverse image to distinguish it from ordinary alphanumeric entries.

In the BISYNC example in Figure 26-2, ALT-p stands for a 4-byte polling address. In Figure 26-3, ALT-f is a 2-digit address byte. ALT-d and ALT-o are 1-byte destination and origin addresses in an SNA message unit.

TABLE 26-1
LEGAL CONSTANTS FIELDS

TRIGGER CONDITIONS MENU	TRIGGER ACTIONS MENU	MESSAGE MENU
FOR: STRG 10F FRAME TYPE: OTHER00 ADDR: PACKET TYPE: OTHER00 LCN: PS REC ERROR: LCN= CTR:	PROG #: FR TYPE: OTHER00 ADR: PK TYPE: OTHER00 LCN: TEXT: XMT VAR: RECBUF: RESET PR/PS: LCN:	FRAME DEFINITION ADDRESS: TYPE: OTHER 00 PACKET DEFINITION LCN: TYPE: OTHER 00 CAUSE: OTHER 00 TEXT: DIAGNOSTIC: DIAG CODE: DIAG EXPL: CALLED DTE ADDR CALLING DTE ADDR FACILITIES

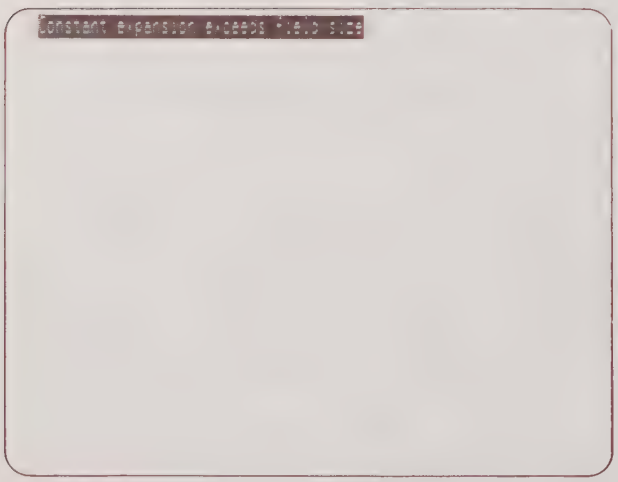


Figure 26-5

Figure 26-6

Figure 26-4 represents a message-buffer screen in an X.25 test. ALT-a is a 1-byte hexadecimal frame address, defined on the Parameter C menu as two digits. The value of ALT-b is a 3-digit LCN. ALT-c represents a 2-digit cause byte. ALT-d replaces a 1-byte hexadecimal diagnostic string. The Parameter C screen that defines these constants is shown in Figure 26-1.

26.3 EXPANSION OF CONSTANTS

When the value of a constant (or a string of constants, or the combination of a constant and a numeric entry) is a longer string than a menu field can accommodate, the unit will display an error message when it enters RUN mode. See Figure 26-5. There is one exception to this. In fields that clear to zero (see, for example, the CAUSE: OTHER field in Figure 26-4), the value of a constant combined with a numeric entry may exceed the length of the field without causing an error message (when the constant appears to the left). Instead, when the constant on the left expands, the numeric entry is bumped from the field. Thus the zero in the CAUSE field in Figure 26-4 will be bumped if constant "c" equals a 2-digit number. Since there is no way for the operator to clear that zero, the unit simply forces it out of the field.

A constant can be used to define another constant, but not to define itself. See Figure 26-6, and see the related Run Mode error message in Figure 26-7. When the value of a constant is illegal in the field where the constant is used, the message in Figure 26-8 appears in Run Mode.

26.4 SAVING CONSTANTS WITH A PROGRAM

The selection SAVE CONSTANTS WITH PROGRAM appears at the bottom of the Parameter C menu (see Figure 26-6). Select YES prior to saving a program whenever you wish to retain constants with your program. Select NO if you do not want to save constants with your program.

Constants can be used as a form of interprogram communication if you use the Save Constants selection properly. Suppose, for example, that you have developed a group of constants on the Parameter C screen. You can pass these constants to another test when the new test is loaded from tape or transferred into the unit. As long as SAVE CONSTANTS WITH PROGRAM: NO was selected as part of the program which is being loaded, the constants already on the Parameter C screen will not be overwritten and can thus be used as part of the new test program.

The same constants can be used in a series of tests. However, if SAVE CONSTANTS: YES is selected as part of a program, the constants residing in the COMSTATE II will be overwritten whenever this program is loaded.

NOTE: Be careful when loading a program without constants into a COMSTATE II with resident constants. If the loaded program is then saved, it will contain constants, which could alter the way that the program works. To avoid this, you MUST reselect SAVE CONSTANTS: NO on the Parameter C screen before saving the program.

Figure 26-7

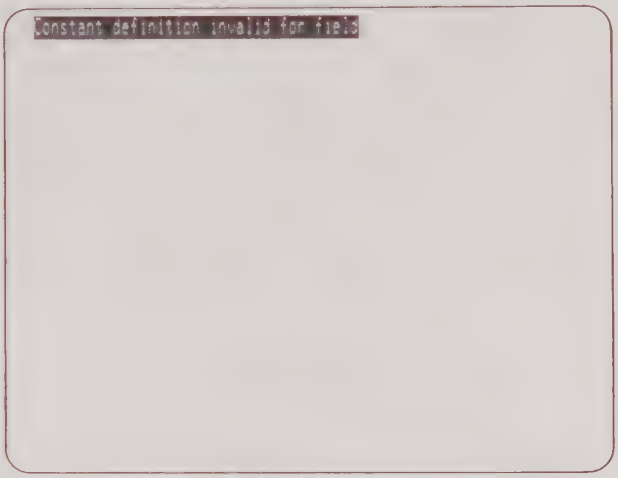


Figure 26-8

27 PROTOCOL SPREADSHEET SCREEN

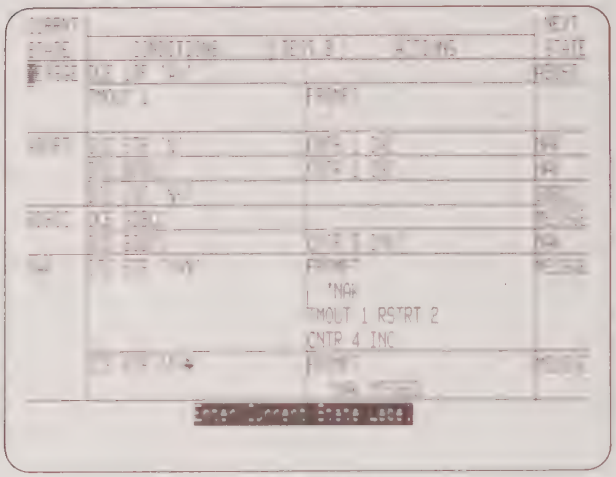


Figure 27-1

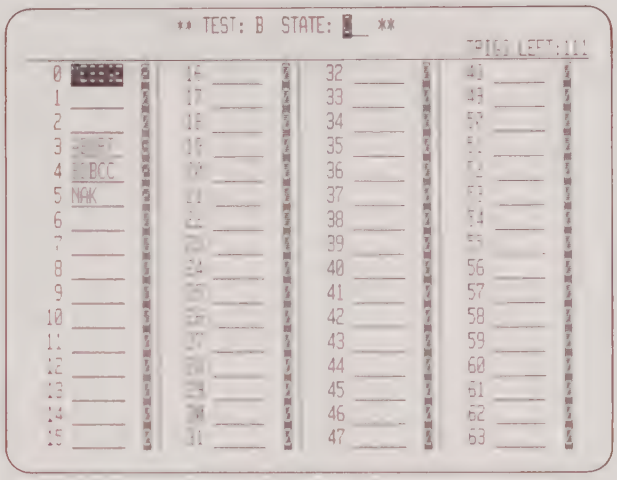


Figure 27-2

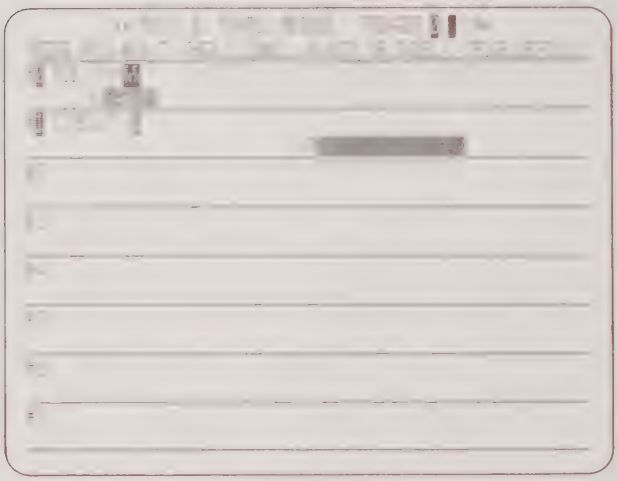


Figure 27-3

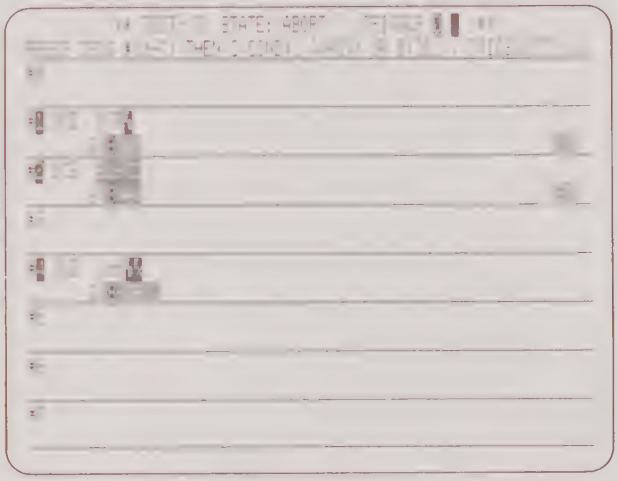


Figure 27-4

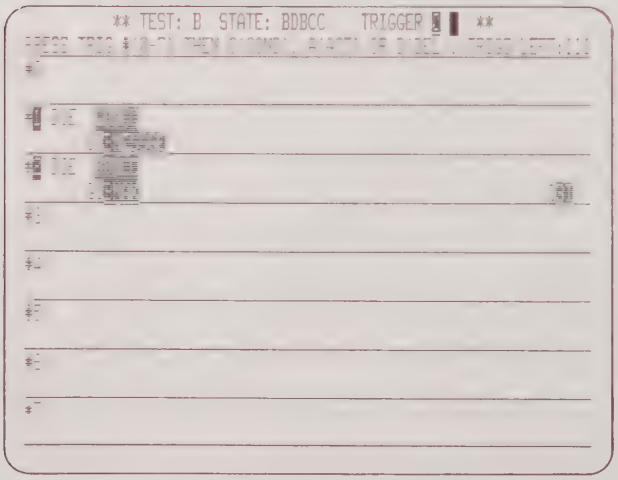


Figure 27-5

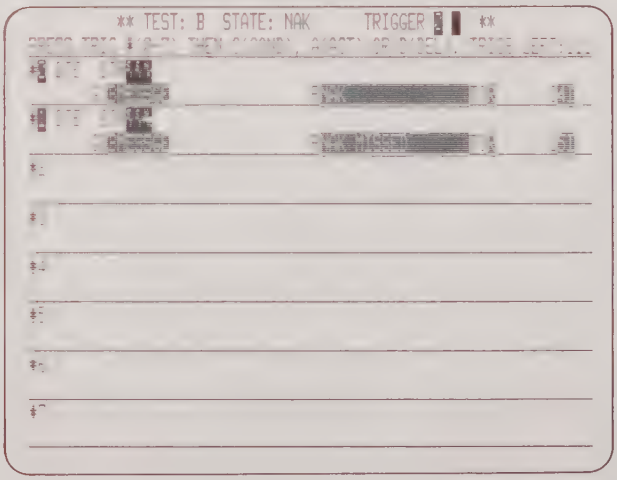


Figure 27-6

27
PROTOCOL SPREADSHEET™ SCREEN: INTRODUCTION

The PROTOCOL SPREADSHEET screen is an entry and display feature that makes COMSTATE II's triggers even easier to use. The PROTOCOL SPREADSHEET screen consolidates states and their triggers in a concise display. Changes and new entries can be made directly onto the spread sheet, shown in Figure 27-1.

The PROTOCOL SPREADSHEET screen also enables you to send concise and readable hard copy of a test-program to a printer. See Figure 27-9; also see Section 38.3, Printout Procedures.

The spread-sheet screen in Figure 27-1 shows a COMSTATE II test with 4 states. If the PROTOCOL SPREADSHEET screen were not used, the COMSTATE II would require 5 screens to summarize the same test. See Figures 27-2 through 27-6.

Those trigger summaries in Figures 27-3 to 27-6 are only summaries, not entry screens. Unlike the spread-sheet screen, they do not allow you to make program entries directly to them. So in addition to these 5 summary screens, the spread-sheet screen does the work of 18 trigger-condition and trigger-action menus like those in Figures 27-7 and 27-8.

Without the spread-sheet screen, if you wanted to increment Counter #3 in Trigger 0 of NAK State (Figure 27-8), and you were starting from the state-summary screen in Figure 27-2, you would need 25 key-strokes to make the entry. The spread-sheet screen gets you there in 10 key-strokes, and you are less likely to get detoured along the way.

This section and the next 4 sections in the manual explain how programs are entered into the COMSTATE II using the PROTOCOL SPREADSHEET screen. The spread-sheet screen facilitates programming and program analysis. It has no effect on the unit's capabilities or its performance in the RUN mode. For detailed explanations of each programming selection, consult the appropriate sections of this manual.

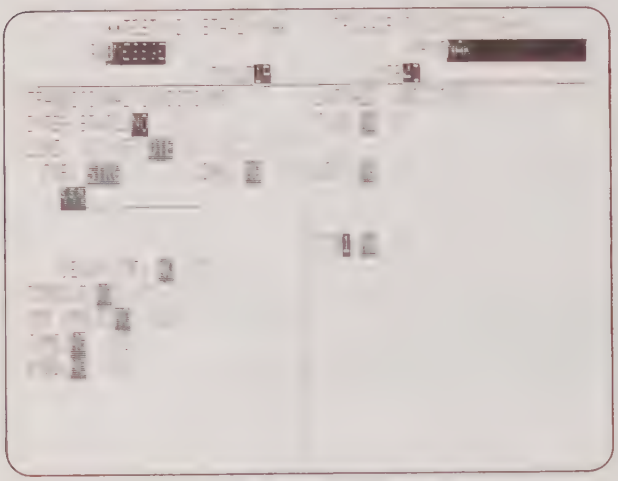


Figure 27-7

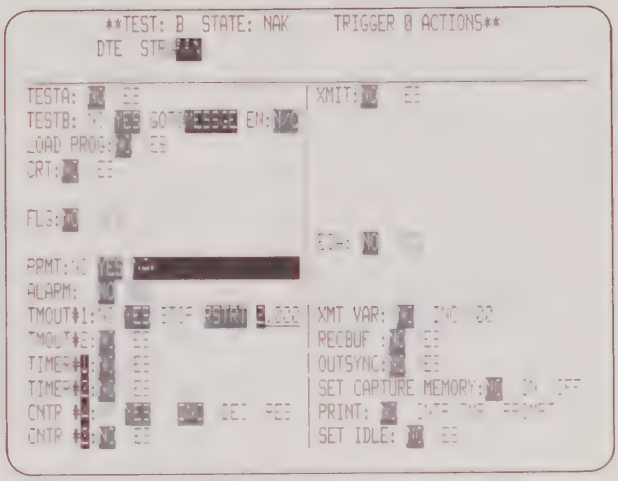


Figure 27-8

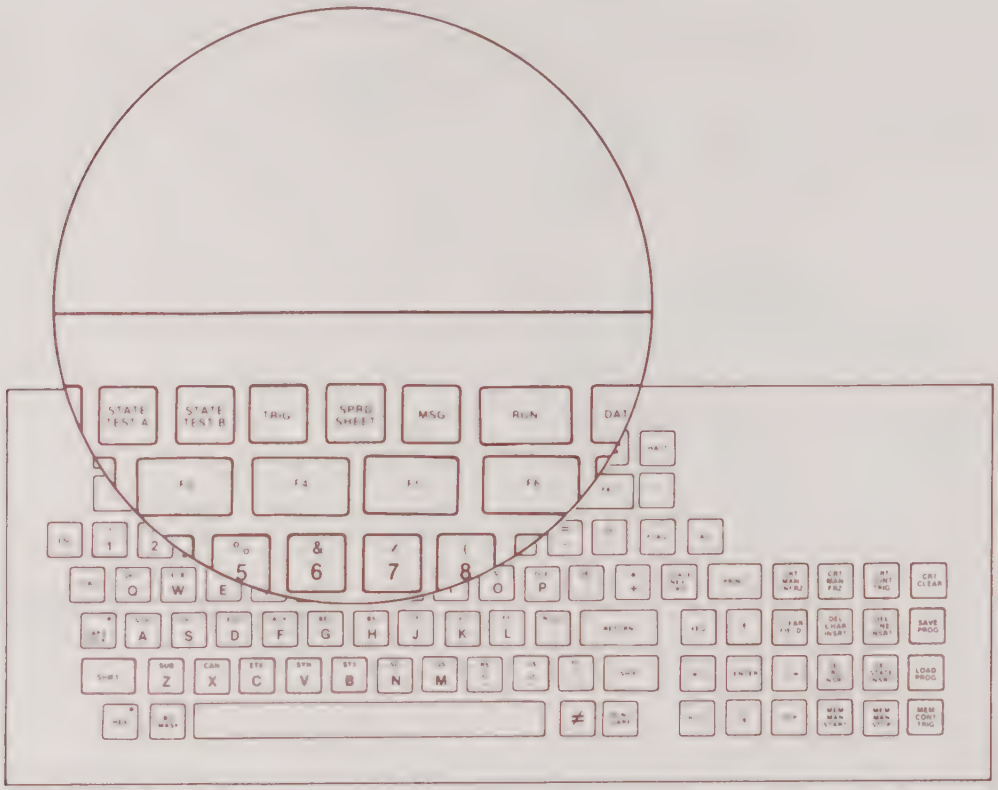
COMSTATE II SPREADSHEET PROG: MON BISYNC NAK PAGE: 1

	CURRNT STATE	CONDITIONS	TEST B	ACTIONS	NEXT STATE
S000					
T000	MESSGE	DCE 1OF 'shsx'			ABORT
T001		TMOUT 1		PROMPT ' '	
S003					
T000	ABORT	DCE STR 'eq'		CNTR 1 INC	NAK
T001		DCE 1OF 'ebex'			BDBCC
S004					
T001	BDBCC	DCE GDBCC			MESSGE
T002		DCE BDBCC		CNTR 2 INC	NAK
S005					
T000	NAK	DTE STR 'synk'		PROMPT 'NAK '	MESSGE
				TMOUT#1 RSTRT 2	
				CNTR 3 INC	
T001		DTE 1OF ' FF'		PROMPT 'NAK MISSED '	MESSGE
				TMOUT#1 RSTRT 2	
				CNTR 4 INC	

TW-926-085

Figure 27-9

28 SPREAD-SHEET TEST



TW-926-032

Figure 28-1

28
BUILDING A SPREAD-SHEET TEST

28.1 TWO TESTS, TWO SPREAD SHEETS

There are two separate displays of the PROTOCOL SPREADSHEET in the COMSTATE II at any given time: one for Test A and the other for Test B. When you hit the SPReaD SHEET key, the spread sheet from one of the two tests will be displayed. At the top of the screen will be a trigger from one of the tests. Which test, and which trigger, depends on where you were in the program when you pressed the SPRD SHEET key.

If you power up your unit and press PROGRAM, SPRD SHEET after the self-test, the PROTOCOL SPREADSHEET screen cursor will be in Test A, State 0, Trigger 0. See Figure 28-1.

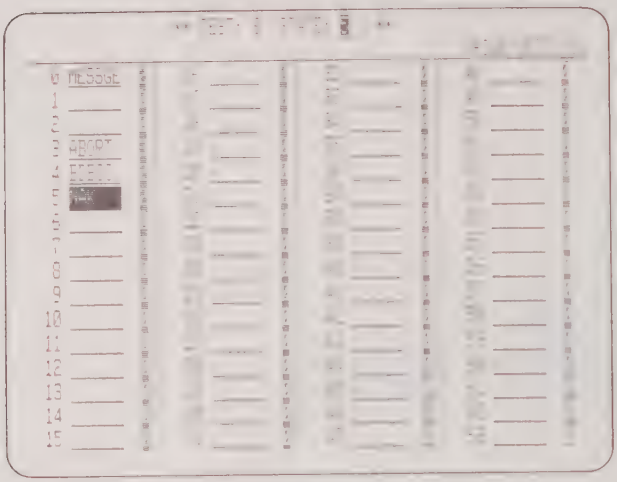


Figure 28-2

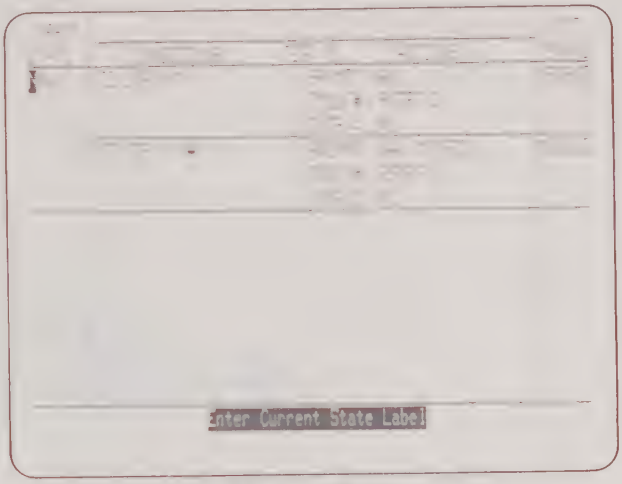


Figure 28-3

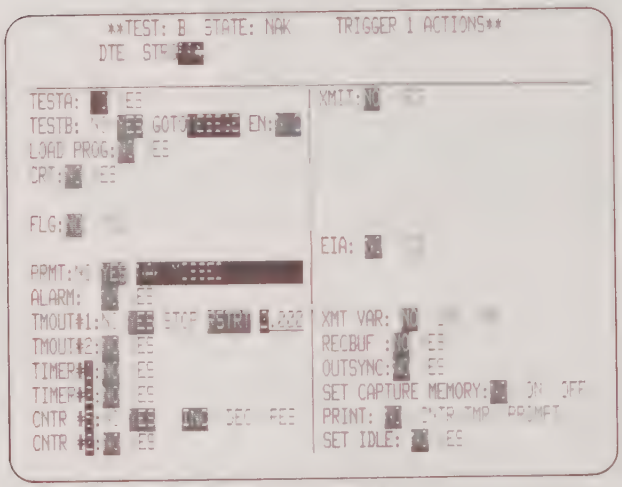


Figure 28-4

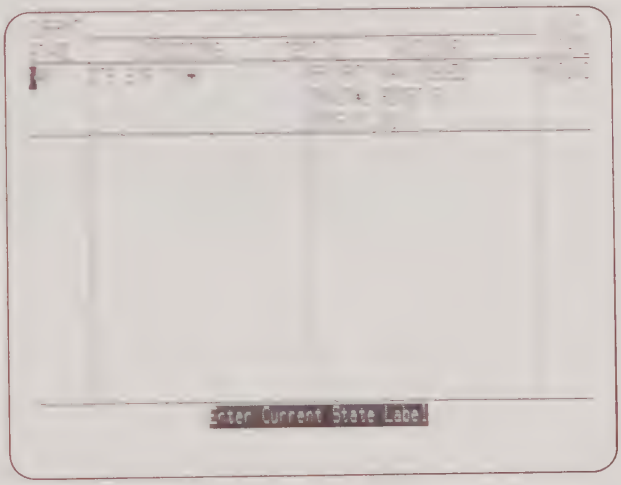


Figure 28-5

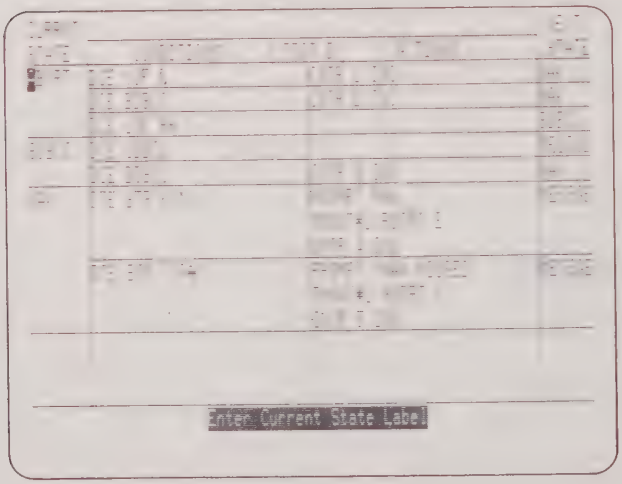


Figure 28-6

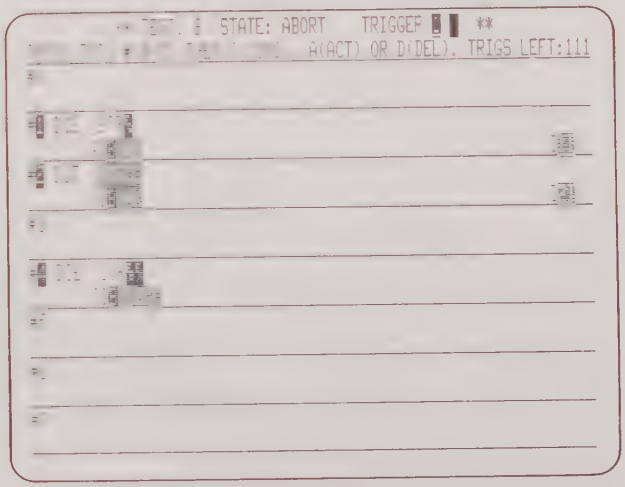


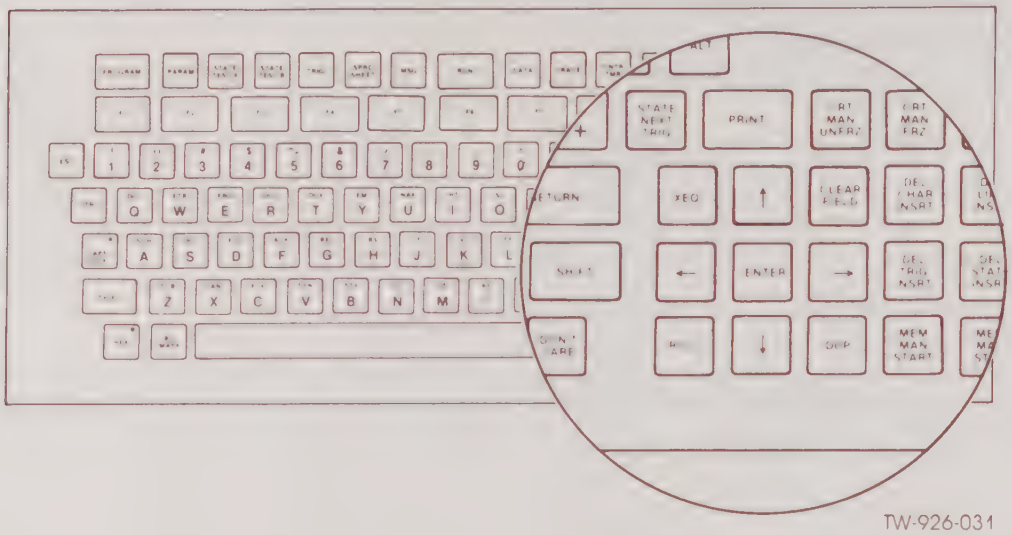
Figure 28-7

28.2 PARALLEL MOVEMENT OF PROTOCOL SPREADSHEET SCREEN AND OTHER COMSTATE II MENU SCREENS

If you load a program, choose one of the state summaries, and enter a state number at the top of the screen, that is the state that will appear when you press the SPRD SHEET key. See Figures 28-2 and 28-3. If you go to one of the trigger menus in a certain state, and then press SPRD SHEET, that trigger will appear at the top of the PROTOCOL SPREADSHEET screen. See Figures 28-4 and 28-5.

Press the UP ARROW key and the spread sheet will scroll up. If you stop scrolling and press TRIGger, the state where the cursor last appeared will display its trigger summary. See Figures 28-6 and 28-7. If you want to go from the trigger summary to, for example, a trigger actions menu, the trigger number is already selected (by the spread-sheet cursor). Simply press TRIG, ENTER, A.

The PROTOCOL SPREADSHEET screen and the summary and entry screens move in parallel at all times.



TW-926-031

Figure 28-8

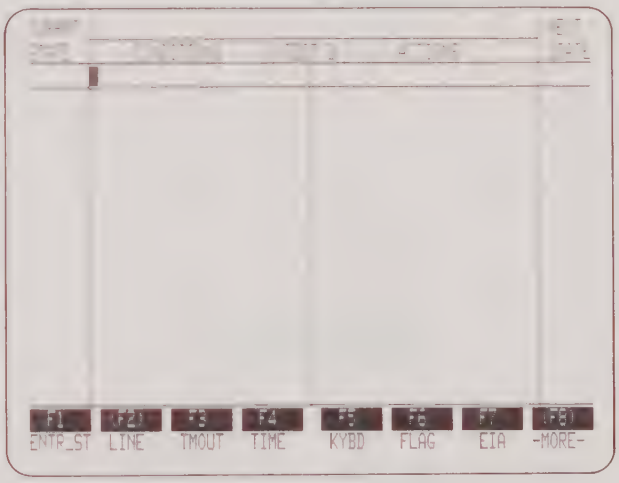


Figure 28-9

28.3 BUILDING A TEST: ADDING STATES, TRIGGERS, LINES

The cursor is in the CURReNT STATE area whenever you first enter the PROTOCOL SPREADSHEET screen. The RIGHT ARROW key moves the cursor one space to the right, while a SHIFT-RIGHT ARROW (or CTRL-RIGHT ARROW) moves it over one area to the right. See Figures 28-8 and 28-9. The LEFT ARROW key works in the same way. The UP and DOWN keys move the cursor one line at a time as long as it is not at the beginning or end of the program.

SHIFT-UP and SHIFT-DOWN (or CTRL-UP or -DOWN) perform two distinct actions. In the CONDITIONS, ACTIONS or NEXT STATE areas, press SHIFT(CTRL)-UP or use SHIFT(CTRL)-DOWN to move the cursor from trigger to trigger, inside of states and across state boundaries. But in the CURReNT STATE area, these same keys make the cursor jump from state to state.

Imagine that you have completed the state and trigger entries in Figure 28-10. In order to proceed with the program, you need more room, either another line in the trigger you are in, another trigger, or a brand new state. But when you hit the DOWN ARROW key you get the error message shown in Figure 28-11.

To add a line, press the RETURN key. See Figure 28-12. You get a line automatically whenever you move the cursor (by typing) to the margin of an area. Fourteen lines is the maximum window size for a trigger. Figure 28-13 shows a trigger that will not accept another line.

To add a trigger, press the STATE NEXT TRIGGER key. See Figure 28-14. Figure 28-15 shows a state that has reached its limit and refuses any more triggers.

To add a state, press CTRL-STATE NEXT TRIGGER. See Figure 28-16.

Figure 28-10

Figure 28-11

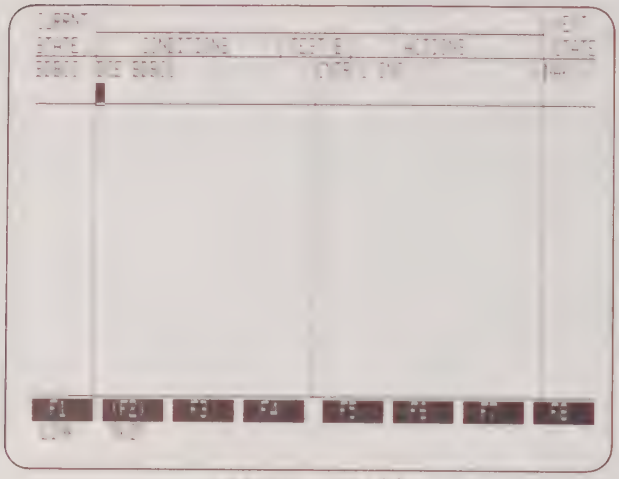


Figure 28-12

Figure 28-13

Figure 28-14

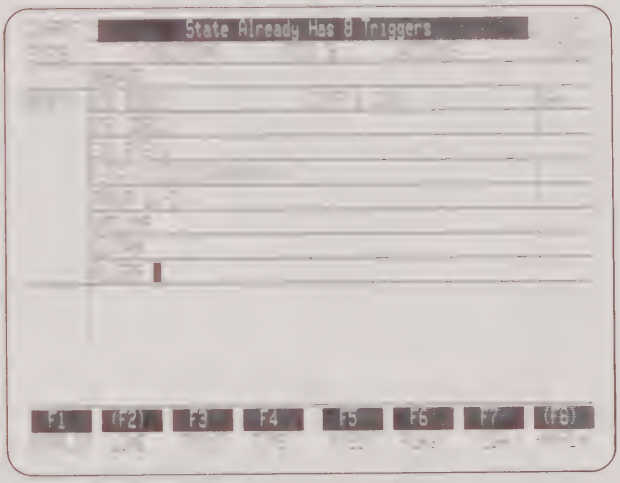


Figure 28-15

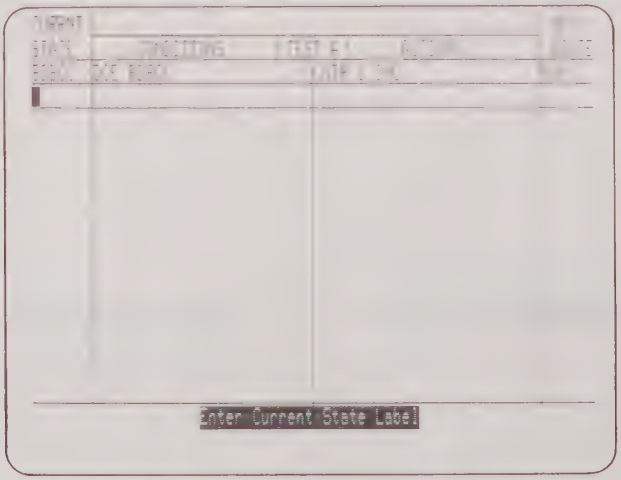


Figure 28-16

29 SOFT KEYS

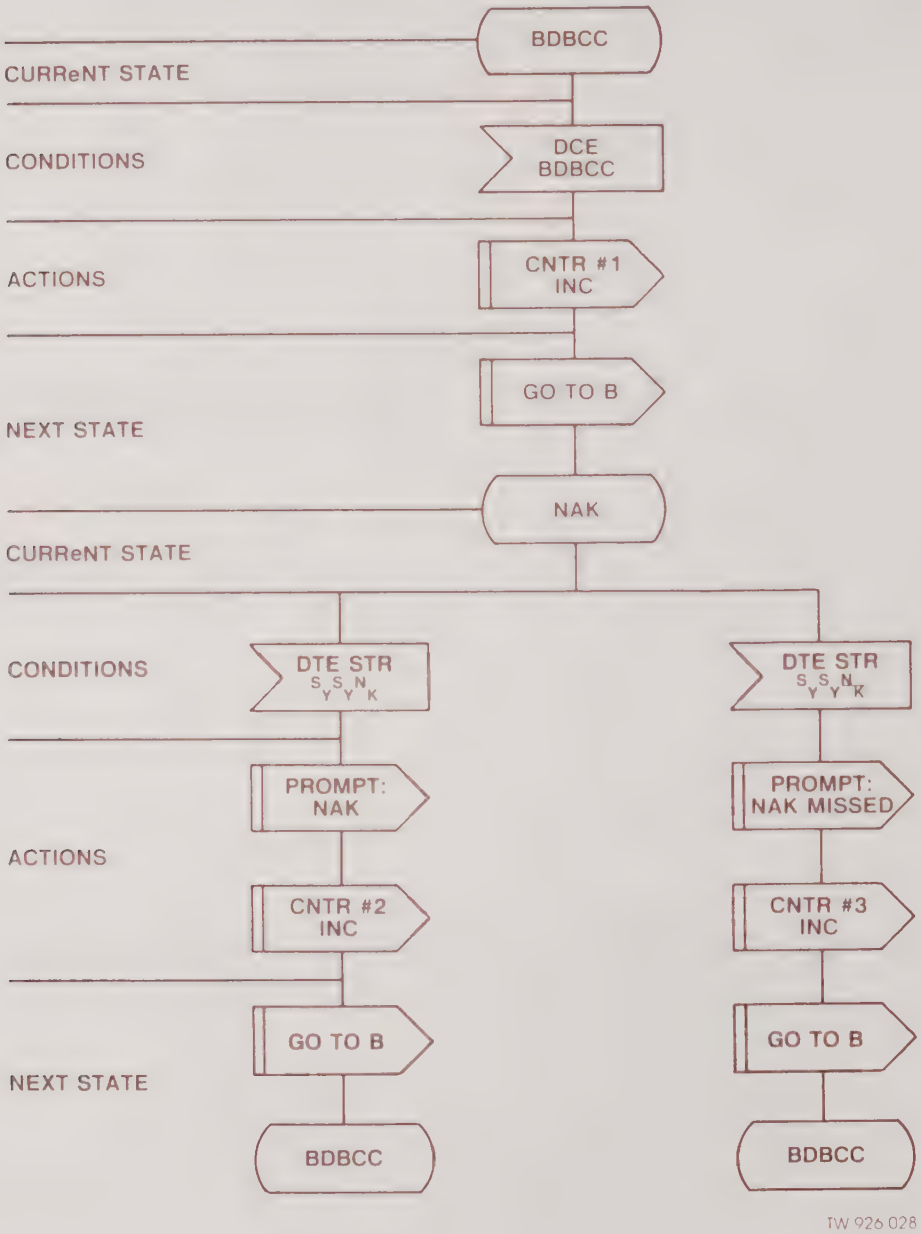

BDBCC
CURReNT STATE
CONDITIONS
DCE
BDBCC
ACTIONS
CNTR #1
INC
GO TO B
NEXT STATE
NAK
CURReNT STATE
CONDITIONS
DTE STR
S Y S Y N K
DTE STR
S Y S Y N K
PROMPT:
NAK
PROMPT:
NAK MISSED
ACTIONS
CNTR #2
INC
CNTR #3
INC
GO TO B
GO TO B
NEXT STATE
BDBCC
BDBCC
TW 926 028

Figure 29-1

29
SPREAD-SHEET ENTRIES: SOFT KEYS

A test program can be entered directly on the PROTOCOL SPREADSHEET screen in two ways. One way is to use the medium-grey function or soft keys, F1 to F8, on the COMSTATE II keyboard. A second way is to use the light-grey ASCII-keyboard keys to make entries character by character (see Section 30). This section will describe soft-key entry.

29.1 ALTERNATE BANKS OF KEYS

Figure 29-1 shows a state diagram of a test program, divided into sections that indicate the area where each entry would belong on the spread-sheet screen.

To enter this program, you would first press STATE TEST B, SPRD SHEET. You would find the cursor in the CURReNT STATE area of a blank spread-sheet screen, with a horizontal line below the cursor marking the boundary of one state. (See Figure 29-2.) After you typed in the name of the CURReNT STATE, you would press SHIFT-RIGHT ARROW to move over to the CONDITIONS area.

As soon as the cursor arrives in the CONDITIONS area, a conditions menu appears at the bottom of the spread sheet. The menu selections correspond to the 8 wide, medium-grey function keys on the COMSTATE II keyboard. (See Figure 29-3, bottom.)

There are twelve top-level selection fields on a complete COMSTATE II conditions menu. These are the fields that appear when you first bring up the menu. (See Figure 29-4.) This menu is not always complete. Some fields appear and disappear according to your FORMAT selection on the Parameter 1 menu.

On the spread-sheet screen, these top-level selection fields appear as function keys whenever you first move the cursor into the CONDITIONS area, and whenever you move the cursor one space away from a completed entry in that area.

When more than 8 selections are available at a given time, a "-MORE-" selection appears at the F8 key on the spread-sheet screen. Compare Figures 29-3 and 29-5.

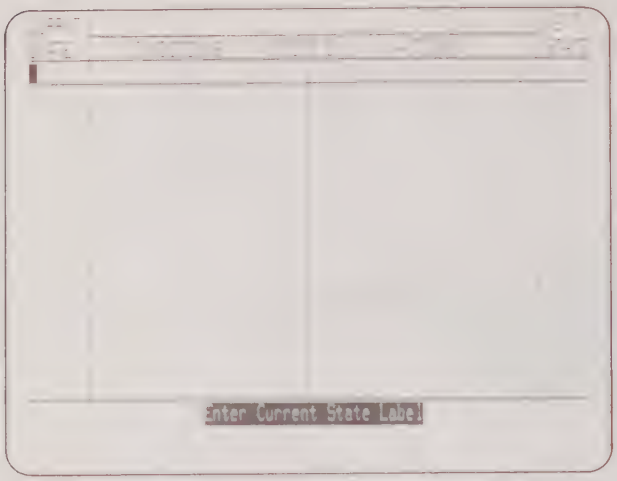


Figure 29-2

Figure 29-3

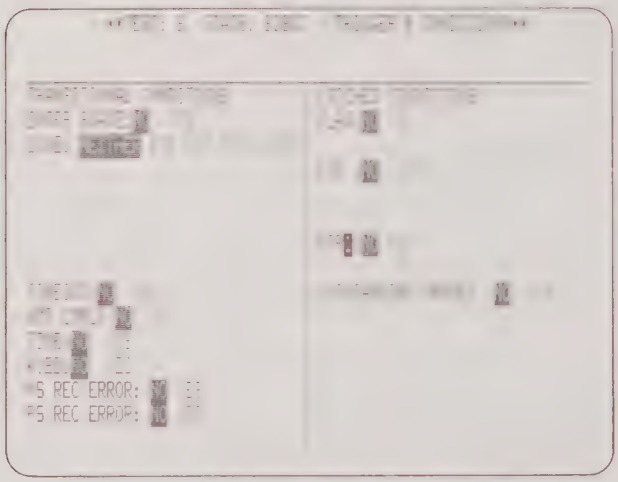


Figure 29-4

Figure 29-5

29.2 LAYERS OF SELECTION KEYS

According to the state diagram in Figure 29-1, your trigger condition is a bad block check on the DCE side of the line interface. On the first bank of top-level selections, press LINE (F2). A layer of LINE selections appears. Select the soft key for DCE (F1; see Figure 29-6). When a new layer of soft-key selections appears (Figure 29-7), press F6 for BDBCC. Finally, select NOLINK (F2, Figure 29-8), since you don't want this LINE condition linked to a subsequent trigger. Now that the LINE entry is completed, the top-level menu selections reappear.

Notice also that on the first bank of Conditions menu selections (Figure 29-3), F2 and F8 are in parentheses. This means that when you depress these keys, nothing will be entered on the spread sheet. Instead, the keys will change. A subset (pertaining to LINE) or alternate bank (-MORE-) of selections will appear. Parentheses mean that this key takes you, WITHOUT A TEXT ENTRY, to another set of selections.

In the ACTIONS area, the trigger entry will be to increment Counter #1. Press the F8 (-MORE-) key until you find the top-level actions key for counters. CouNTeR is the F3 key in the second bank of top-level actions keys. See Figure 29-9. Press F3; then enter the counter number and press the NEXT key (F8; see Figure 29-10). Press F1, INCrement (Figure 29-11). With that selection, the entry is complete. As a result, the cursor moves over one space to the right, and the soft keys change back to the original, top-level selections.

Notice what happens when you hit the LEFT ARROW key once. See Figure 29-12. Even though the cursor is only adjacent to the previous entry rather than directly over it, according to the soft keys you have gone back to the selection of whether to increment, decrement or restart Counter #1. If you press F2 or F3, the F1 selection you made earlier will be overwritten. If you repeat the LEFT ARROW key, the soft-key selections will change as the cursor moves, allowing you to make a soft-key change at any level of the entry. (Note that replacing a selection may render subsequent selections incorrect.)

The next state in this program is NAK. In order for the program activity to go there, simply enter NAK in the NEXT STATE area. (See Figure 29-13.) Since this is a Test B spread sheet, all entries in the NEXT STATE area will apply to Test B. If you want to activate a state in Test A, make that selection in the ACTIONS area. The appropriate top-level function key is STAte ConTroL (F2, Figure 29-14). Sections 20 through 25 and 39 through 49 in this manual explain this selection and all other trigger conditions and actions in detail.

Figure 29-6

Figure 29-7

Figure 29-8

Figure 29-9

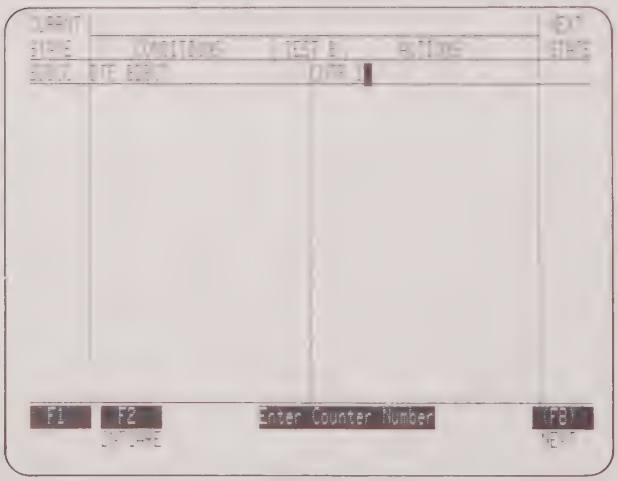


Figure 29-10

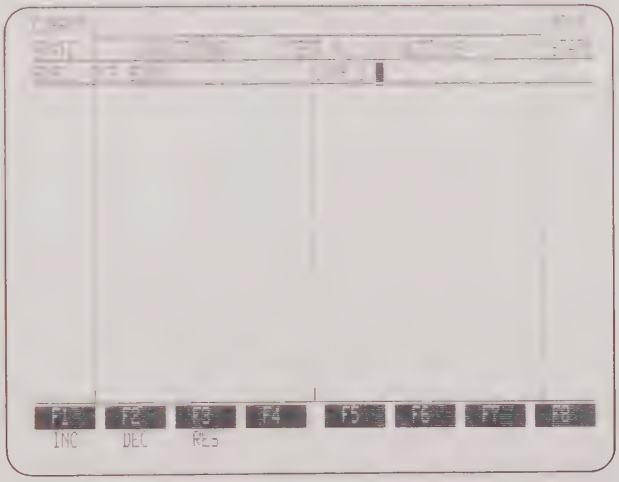


Figure 29-11

Figure 29-12

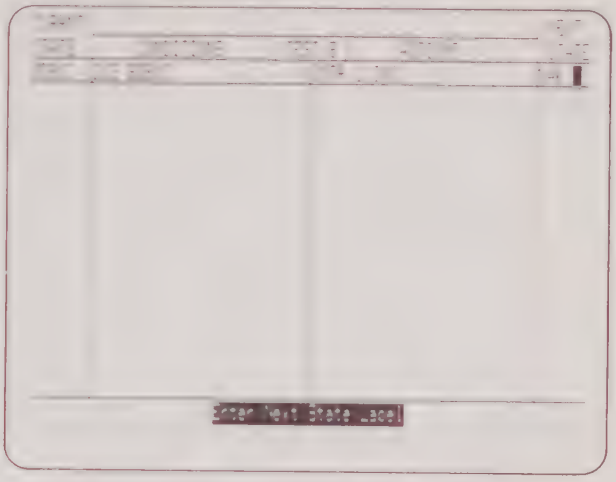


Figure 29-13

Figure 29-14

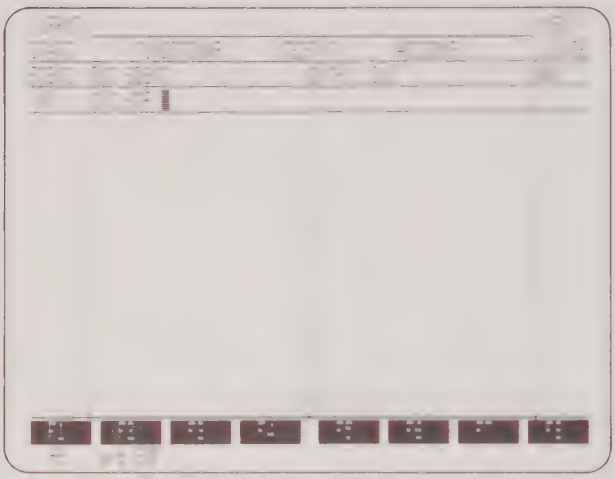


Figure 29-15

Figure 29-16

Figure 29-17

Figure 29-18

29.3 DATA STRING ENTRY: WHEN TO USE SINGLE QUOTES

On the state diagram in Figure 29-1, the first trigger in NAK state has a string condition on the DTE side of the interface. After you have used SHIFT-DEL STATE INSRT or CTRL-STATE NEXT TRIG to add a state, and entered NAK in the CURRNT STATE area, the correct soft-key sequence is SHIFT-RIGHT ARROW, F2 (LINE), F2 (DTE), F1 (STRing), F2 (w/o EOF). (Without End Of Message means that the trigger will not delay coming true until the frame check sequence at the end of the message.) See Figure 29-15.

Enter your data string. See Figure 29-16.

Many character entries will need single quotes (apostrophes) around them. Strings of standard ASCII data and control characters need not be enclosed in quotes. For example, the DTE string you just entered did not have single quotes around it. For another example, to enter a "NAK" prompt in the ACTIONS area, you would simply press the F6 top-level actions key for PROMPT, and type in NAK. However, any string entered in any field must be enclosed in single quotes if it contains the following: blank spaces, flags, carriage returns, bit masks, DON'T CAREs, NOT EQUALs, or hex characters. (See Figure 29-17.) Press the soft key labeled DON'T CARE (F2) if you wish to leave a character-data field empty. The F2 key will produce two adjacent single quote marks ('') on the spread-sheet screen to indicate the empty field. (In certain cases, the empty field will be designated by Xs.) These empty-field designators are important and should not be omitted, whether you are entering your selections from the soft keys or from the ASCII keyboard. (See Section 30.)

To enter a bit mask, first make sure that the character-entry is inside single quotes (use Shift-7). Then press BIT MASK. A low-intensity reverse-video M will appear at the cursor position, followed by 8 Xs (DON'T CAREs) in high-intensity reverse. Enter your bit mask by modifying this string. (See Figure 29-18.) Legal entries are X, x, 1, 0, or DON'T CARE. (The latter symbol is produced by the DON'T CARE key at the right of the space bar.)

To use an apostrophe (') inside a string, first enclose the string in single quotes. Then add a second apostrophe to the one you wish to enter. Example: 'DCE''S N(R) INVALID'

Figure 29-19

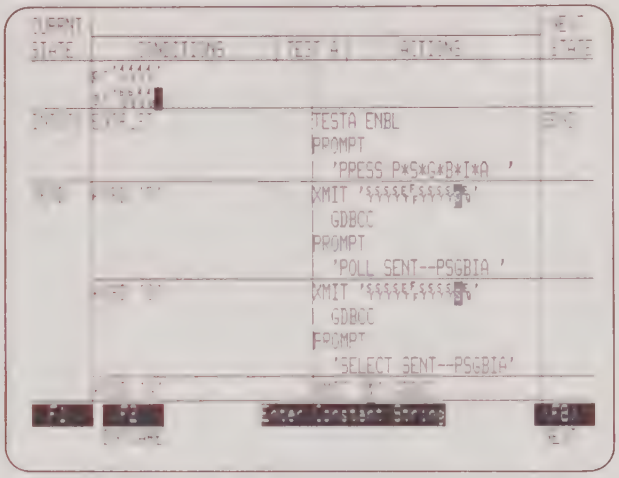


Figure 29-20

TW-926-030

In Figure 29-19, the spread-sheet logic has lined out an entry that was intended as part of a prompt. Since the prompt had a space in it, it should have been enclosed in quotes. (Unless they are between quotes, the spread-sheet display interprets spaces as transitions between entries.) Syntax errors are always signalled by lineouts.

NOTE: Lined-out entries are not stored. This means that if you make an error entry and then, by changing the screen or even by scrolling, you move the entry off the screen, that entry will be lost.

29.4 CHARACTER ENTRY: ALT KEY

In a transmit-text string, ALT-0 through ALT-9 and ALT-A through ALT-F will represent Message Buffers 0-F, just as they did in the XMIT: TEXT field on the trigger actions menus. The spread-sheet display does not replace or duplicate message buffers.

Other ALT-character entries are as follows:

ALT-K = Keyboard entry buffer.

ALT-X and ALT-Y = Receive buffers.

ALT-T, ALT-U, ALT-V, or ALT-W = Transmit variable. This is a two-digit hex number defined in the ACTIONS area of the PROTOCOL SPREADSHEET screen.

ALT-a through ALT-z = Constants. They are defined in the CONDITIONS area just above the first state on the spread sheet. See Figure 29-20. Any lowercase character can be defined as an arbitrary string of characters. This definition is "constant" in the sense that it cannot be changed while a test is being run. In the example in Figure 29-20, constants are used in place of device and control-unit addresses. By changing the constant definition, you change the specific addresses wherever they are used in the test.

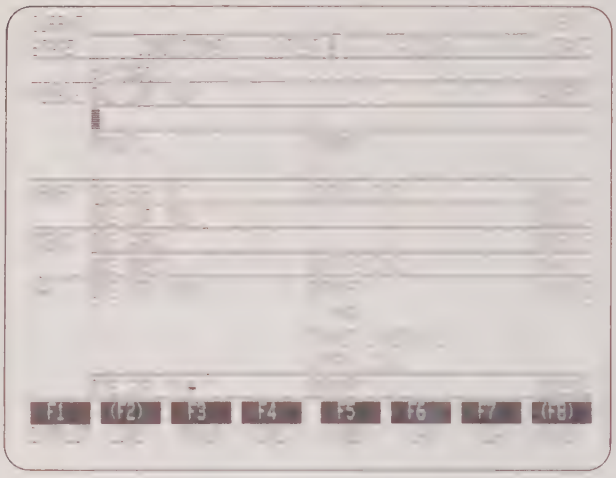


Figure 30-1

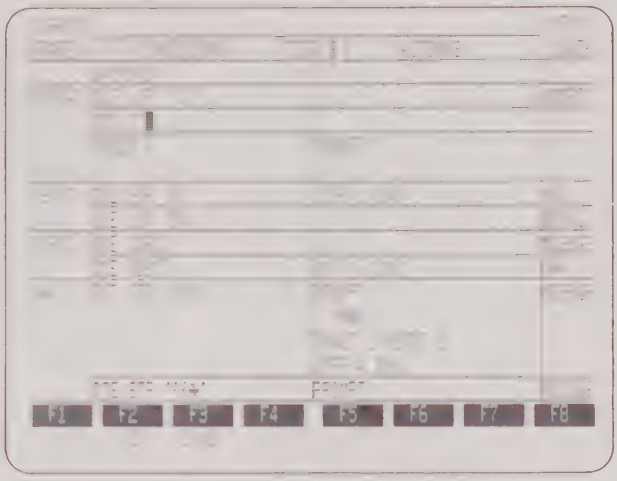


Figure 30-2

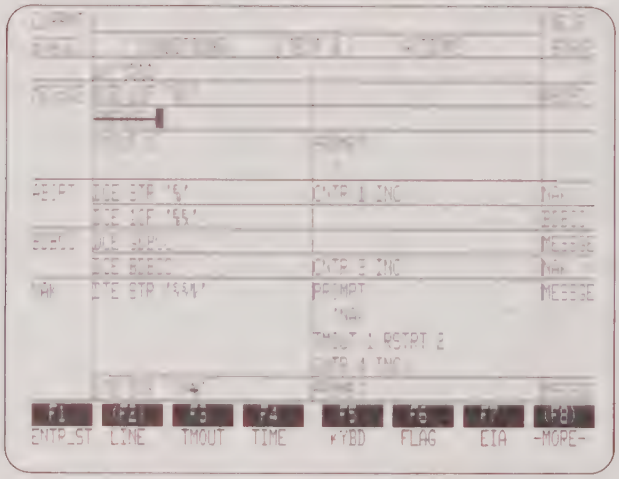


Figure 30-3

30
SPREAD-SHEET ENTRIES: KEYBOARD

You can also type in any entry, if that is convenient. The soft keys and the keyboard entries are interchangeable. Wherever the cursor is positioned on the screen, the soft keys will display those selections that are currently valid. You may switch from soft-key entry to keyboard entry and back again at any time. You can even finish (or change) a half-entered selection by pressing the soft key for the selection you want.

Experienced users undoubtedly will find themselves using the soft keys less and less. These keys remain useful as reminders of what selections are available, and as cues for spelling and syntax.

30.1 TEXT TOKEN ENTRIES

Text tokens are the entries represented by soft keys. (They are distinguished from data tokens, such as strings and messages.) TMOUT, for example, is a token. Suppose that in the blank trigger area that has the cursor in Figure 30-1, you wanted to enter a condition that looked for the first timeout-timer to expire.

Soft key F3 shows you how to spell TMOUT. Type in that token. The software does not care whether the token is in upper or lower case. Press the space bar to indicate that your token is complete. The soft keys switch to the next selection level. See Figure 30-2. Instead of pressing the soft-key selection for timeout-timer #1, enter a keyboard 1 and hit the space bar to indicate a completed entry. The top-level soft-key selections are restored to the screen.

A misspelled text token would have been lined out as soon as you hit the space bar and tried to leave the token entry area. (See Figure 30-3.)

30.2 CHANGES

When you wish to change an entry, simply position the cursor and write over the old entry. (See Figures 30-4 through 30-7.)

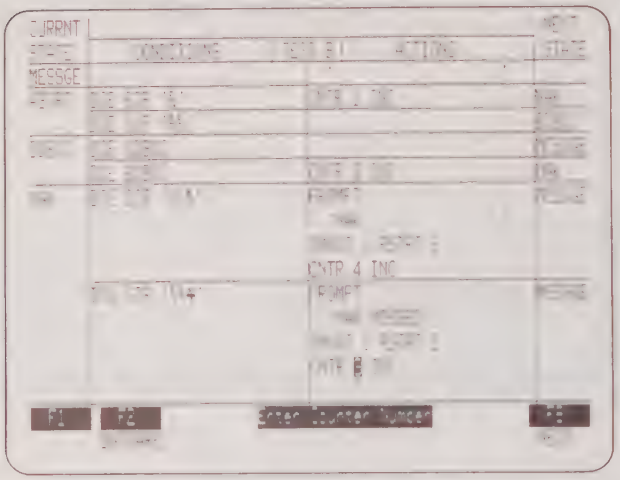


Figure 30-4

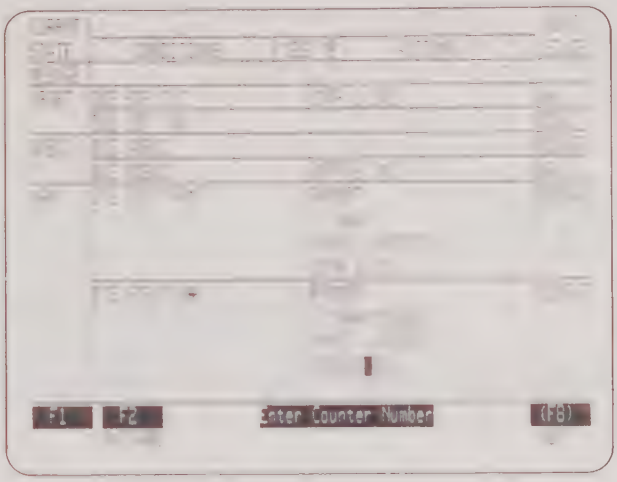


Figure 30-5

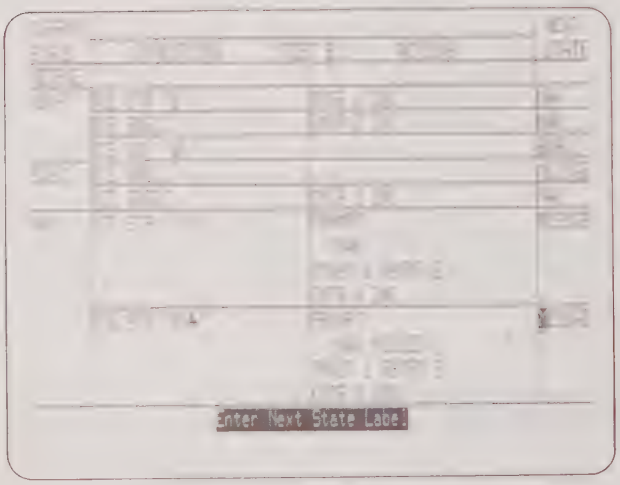


Figure 30-6

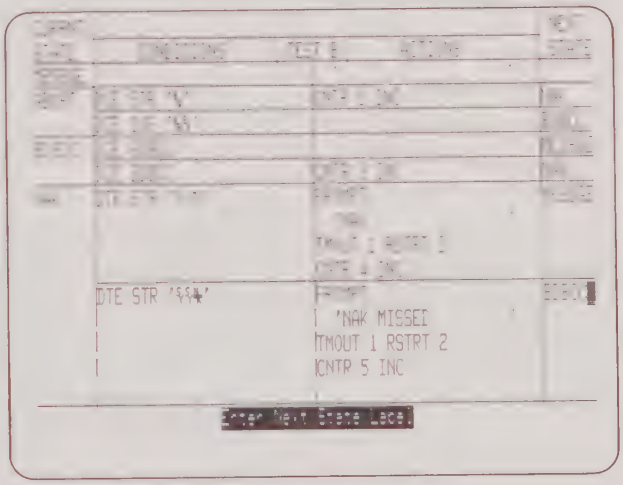


Figure 30-7

31 CHANGING A SPREAD-SHEET TEST

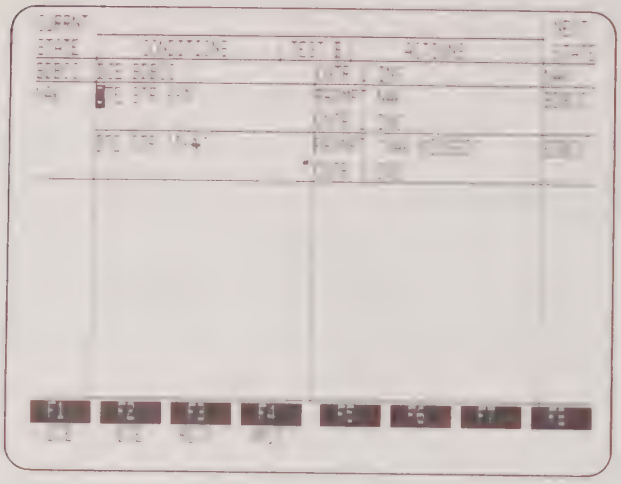


Figure 31-1

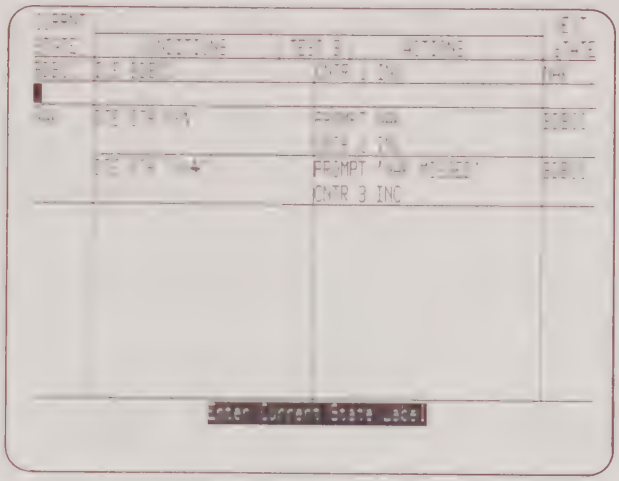


Figure 31-2

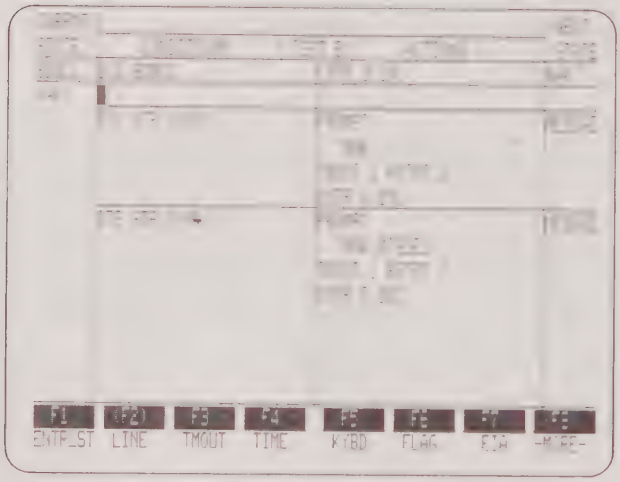


Figure 31-3

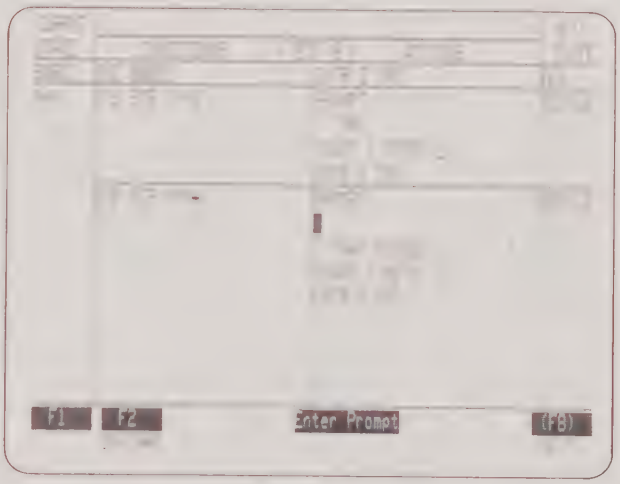
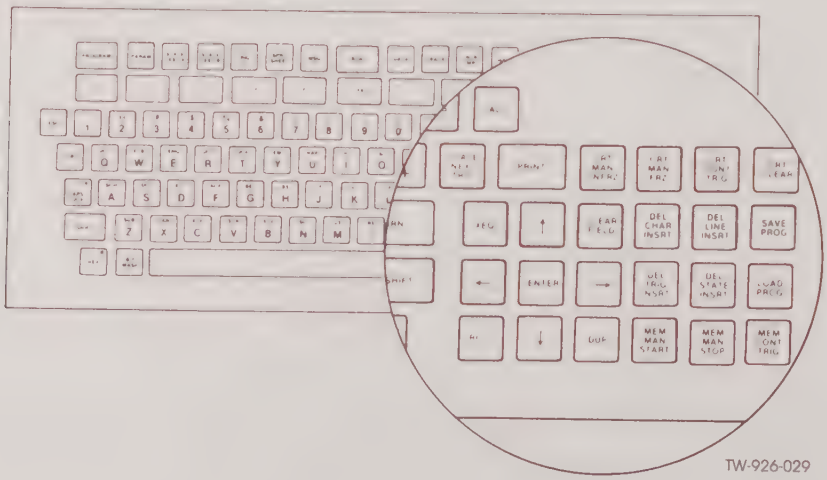


Figure 31-4



31
CHANGING A SPREAD-SHEET TEST

31.1 INSERTING AND DELETING STATES

After a program is entered, a group of four editing keys assist you in making corrections and changes.

Press DELete STATE INSeRT to insert a state above the cursor position. See Figures 31-1 and 31-2.

Press SHIFT-DEL STATE INSRT to insert a state below the cursor. Press CTRL-DEL STATE INSRT to delete the state that the cursor is in.

31.2 INSERTING AND DELETING TRIGGERS

Press DELete TRIGger INSeRT to insert a trigger above the cursor position. Compare Figures 31-1 and 31-3.

Press SHIFT-DEL TRIG INSRT to insert a trigger below the trigger that had the cursor. Press CTRL-DEL TRIG INSRT to delete a trigger.

31.3 INSERTING AND DELETING LINES

To insert a line above the cursor, press DELete LINE INSeRT. See Figure 31-4.

To insert a line below the cursor, press SHIFT and DEL LINE INSRT. Delete a line with CTRL-DEL LINE INSRT.

Deleting a CONDITIONS line will not delete the corresponding CURReNT STATE, NEXT STATE or ACTIONS line.

To clear a line, press CLEAR FIELD. CLEAR FIELD leaves a blank line, whereas CTRL-DEL LINE INSRT removes the line from the spread sheet, in many cases reducing the size of the trigger "window."

To clear part of a line, move the cursor to the first character to be deleted, and press SHIFT-CLEAR FIELD.

31.4 INSERTING AND DELETING CHARACTERS

The DELete CHARacter INSeRT key works in the same way. By itself, the key inserts a space before the cursor position. See Figures 31-5 and 31-6. With the SHIFT key, it inserts a space after the cursor. With the CTRL key it deletes any character framed by the cursor.

Table 31-1 summarizes the action of these editing keys.

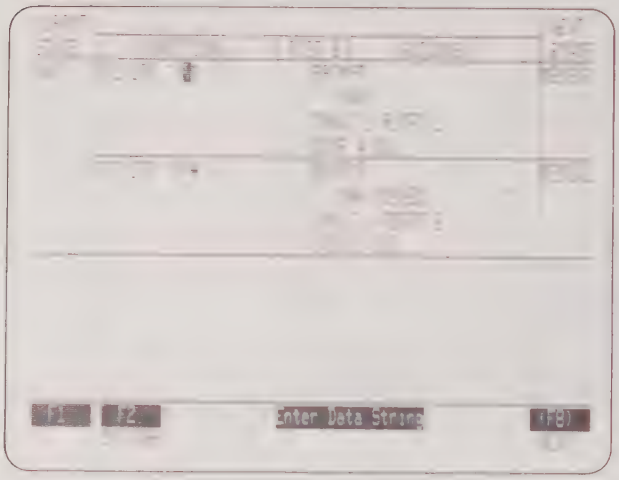


Figure 31-5

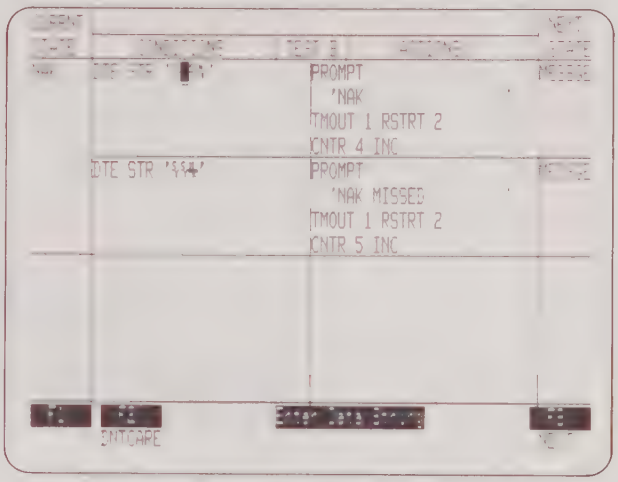


Figure 31-6

TABLE 31-1
DELETE/INSERT EDITING KEYS

KEY	FUNCTION, RELATIVE TO CURSOR POSITION		
	Unshifted	With SHIFT key	With CTRL key
CHAR INSRT	Insert character before	Insert character after	Delete character at
LINE INSRT	Insert line above	Insert line below	Delete line at
TRIG INSRT	Insert trigger above	Insert trigger below	Delete trigger at
STATE INSRT	Insert state above	Insert state below	Delete state at

32
THE CAPTURE MEMORY: GENERAL INFORMATION

The COMSTATE II's Capture Memory comprises an integral tape and an optional high-speed Random Access Memory (RAM). You can record data either on the tape or in RAM, and monitor and analyze data as it is played back. Tape and RAM can be controlled automatically or manually, or by triggers. The data content of the RAM can be transferred to tape or vice versa (Section 35).

There are two types of tapes: On a program-data tape, you can save a COMSTATE II program (with no more than four triggers and six states) along with the data. You can also record multiple-program tapes containing up to 100 blocks. For program recording, see Section 36.

Both program-data and multiple-program tapes can be duplicated. (See Section 37.)

32.1 THE TAPE DRIVE

(a) Tape Installation. The COMSTATE II should be in Program Mode when the tape is installed so that the logic can recognize that a new tape has been inserted.

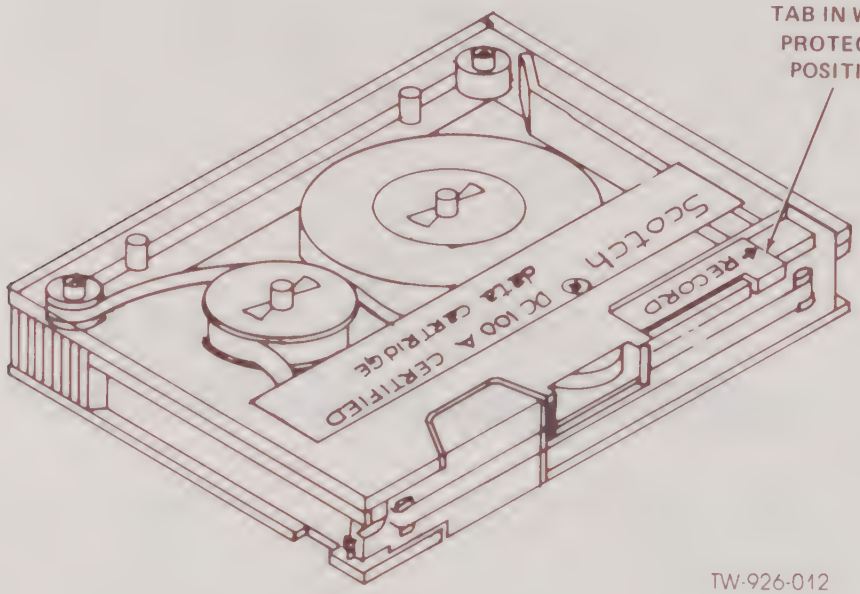
Figure 32-1 shows the COMSTATE II's tape cartridge. The tab on the drive edge of the cartridge is used to write-protect a recorded tape. When the tab is pushed toward the center of the cartridge, the tape cannot be recorded. If you attempt to record on a write-protected tape, the COMSTATE II will display the message TAPE IS WRITE-PROTECTED. To record, position the tab toward the outer edge of the cartridge.

Insert the tape cartridge in the drive at the right of the front panel with the drive wheel to the rear and the transparent window on top. Push it gently in until you feel it lock.

CAUTION: Always press the PROGRAM (or MEM MAN STOP) key to stop tape motion before you remove the tape.

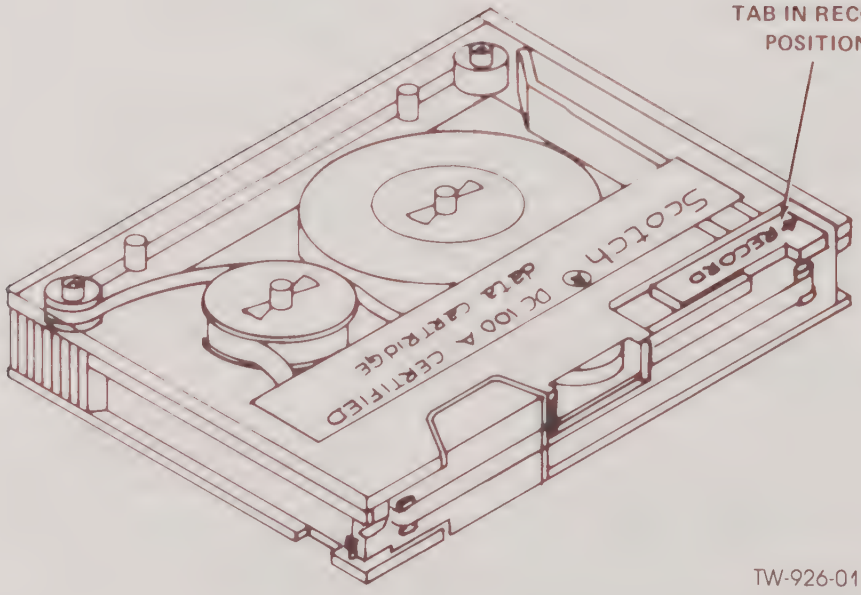
(b) Tape Removal. To remove the tape, press PROGRAM to stop tape motion; then the EJECT button under the tape drive. Pull the tape cartridge out. Removing the tape will not alter the program in the unit.

(c) Tape Drive Maintenance. The tape drive should be serviced regularly.



TW-926-012

"A"



TW-926-013

"B"

Figure 32-1

32.2 TAPE FORMAT

There are 250 to 260 blocks on a program-data tape. One block contains 2400 characters (1200 from each side of the line) when interface status is not recorded. If interface status is recorded on tape, each block will contain 1600 characters (800 from each side of the line) plus 800 interface samples. There are 100 blocks on a multiple-program tape.

32.3 TAPE SPEED

The maximum recording speeds for the tape are (a) 19.2 kbps if interface lead status is not being recorded and (b) 9.6 kbps if interface lead status is being recorded. Maximum tape playback speed is 9.6 kbps.

32.4 HIGH-SPEED MEMORY OPTION (RAM)

The COMSTATE II's optional High-Speed Memory (RAM) will record data at speeds up to 72 kbps. The maximum usable playback speed from RAM is 28.8 kbps. The RAM does not record programs.

When the RAM option is installed, it will be announced on the power-up display as OPTIONS: 05 after the automatic power-up tests are in progress. There are two RAM sizes, as specified in Table 32-1, but the power-up display does not identify which is installed in the unit. If OPTIONS: 05 is displayed, observe the duration of the self tests. With the 1-Megabit RAM, the self tests will take no more than 10 seconds; with the 4-Megabit RAM, the tests will take close to 32 seconds.

A Series 70 error code displayed on power-up indicates a RAM problem, which may in turn affect other boards.

The RAM is a volatile memory, with no power backup. For permanent storage the RAM content must be transferred to tape (see Section 35) or printed (see Section 38) before the COMSTATE II is turned off.

Table 32-1 presents data on the capacity of the two RAM options. The RAM block size is 2400 bytes, just as for the tape. It does not record interface status. The last block of memory is a partial block, as shown in Table 32-1.

TABLE 32-1
COMSTATE II HIGH-SPEED MEMORY OPTIONS

Option		Bytes		Blocks	
Name	Number	Decimal	Hex	Numbers	Partial block
1-Megabit RAM	05-2	131072	128k	0 - 54	54 (1472 bytes)
4-Megabit RAM	05-3	524288	512k	0 - 218	218 (1088 bytes)

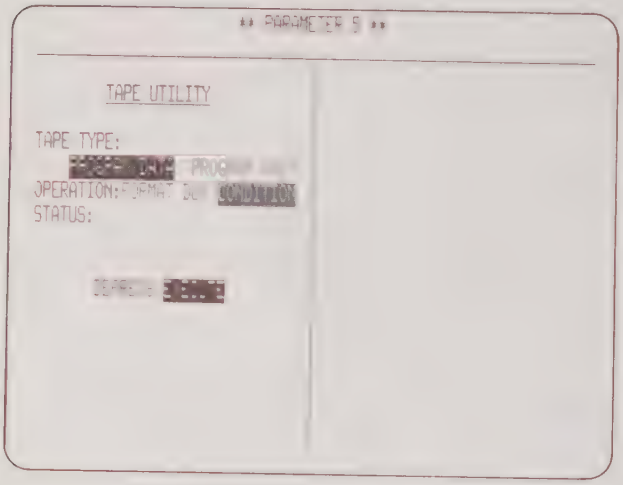


Figure 32-2

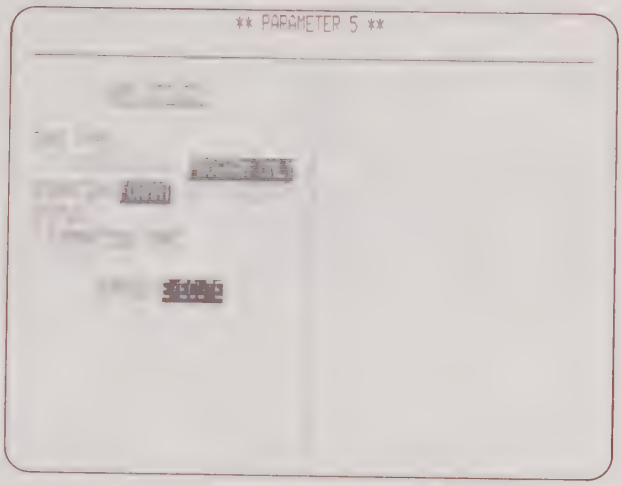


Figure 32-3

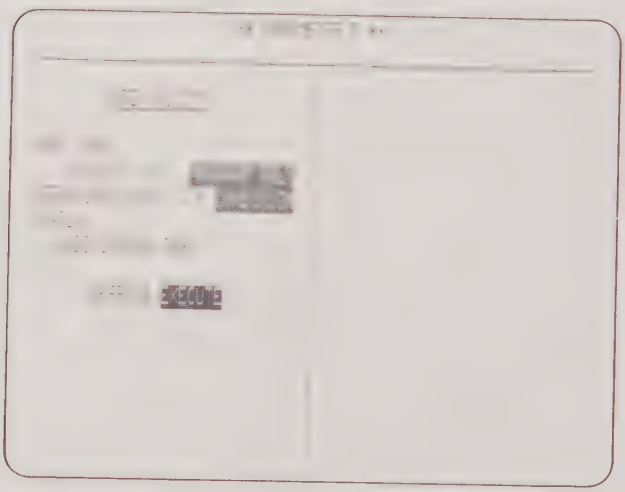


Figure 32-4

32.5 FORMATTING TAPES

For operation in the COMSTATE II, all new tapes must first be formatted either as program-data tapes (approximately 255 blocks) or as multiple-program tapes (100 program records). All formatting can be done automatically.

CAUTION: If there is data on the tape, formatting will erase it.

Press PARAMeter and numeral 5 to display the Tape Utility menu (see Figure 32-2). Install the blank tape -- or a tape to be reformatted -- in the drive with the tab in the RECORD position (toward the outside of the cartridge). Select the TAPE TYPE: PROGRAM/DATA if you want to use the tape for data; PROGRAM ONLY if you want to make a Multiple-Program tape. Select FORMAT, which is the default OPERATION selection, and press the XEQ key.

If the tab on the tape is in the PROTECTED position the tape cannot be formatted, and the status line will display the message TAPE IS WRITE PROTECTED. If the tape is not protected, the message FORMATTING TAPE (Figure 32-3) will blink on the Status line. When formatting is completed, after about 2 1/2 minutes, the STATUS will change to TAPE FORMATTED.

The COMSTATE II can now always identify the tape as a program-data or multiple-program tape and can find any data block or program record on it.

Multiple-program tapes are formatted with the lowest-numbered records at the beginning and the highest-numbered records at the end. All odd-numbered records will be on one track, and all even-numbered records on the other track. Program-data tapes are formatted with the block number sequence going up one track and back the other, so that the lowest and highest numbers are at the beginning of the tape.

32.6 RETENSIONING TAPES

If a recorded tape has not been kept in a controlled environment, it may have been subject to temperature changes or vibration. To avoid faulty operation, especially if the tape is to be used for analysis, it should be retensioned before use.

You may retension any tape without affecting its content by selecting CONDITION on the Parameter 5 menu. Insert the tape with the tab in the PROTECTED position and press the EXECUTE key. The Status line will display CONDITIONING TAPE (Figure 32-4) while the tape is being retensioned; then TAPE CONDITIONED when it is finished.

Each time you use the Parameter 5 menu to format or duplicate a tape, the tape is automatically retensioned.

32.7 DUPLICATING TAPES

Program-data and multiple-program tapes both can be duplicated automatically, using the DUPlicate selection on the Parameter 5 menu. The procedure for this is given in Section 37.

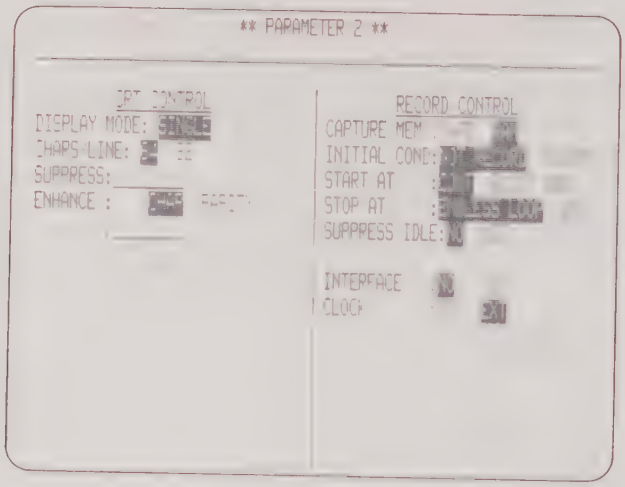

** PARAMETER 2 **
RECORD CONTROL
CAPTURE MEM
INITIAL COND:
START AT
STOP AT
SUPPRESS IDLE:
INTERFACE
CLOCK

Figure 33-1

33
DATA RECORDING AND PLAYBACK

33.1 RECORDING: PARAMETER 1 MENU SELECTIONS

When LINE has been selected for the data source on the Parameter 1 menu, both received and transmitted data may be recorded on the tape. The only other Parameter 1 menu requirement to enable recording is to enter the correct SPEED if INTernal CLOCK has been selected on the Parameter 2 (Record Control) menu.

33.2 AUTOMATIC RECORDING: THE RECORD CONTROL MENU

The Record Control menu is on the same display, Parameter 2, as the CRT Control menu.

NOTE: When TAPE or RAM is selected as data SOURCE on the Parameter 1 menu, the Record Control menu goes away.

(a) Capture Memory. This field (see Figure 33-1) is present only if a high-speed memory (RAM) option has been installed in the COMSTATE II. If TAPE is selected, all fields on the Record Control menu apply to the COMSTATE II'S integral tape; if RAM, they apply to the high-speed memory. Block size of both tape and RAM is the same. (See Section 32 for explanation of tape and RAM block numbering.)

NOTE: All tapes should be formatted before use.

(b) Initial Condition. Data recording may be initiated and stopped automatically when the COMSTATE II enters and leaves Run Mode by selecting INITIAL COND: RECORD. This field is entitled INITIAL CONDition because, whether NOT RECORD or RECORD is selected, this condition may be altered by the Set Capture Memory selection on a trigger menu.

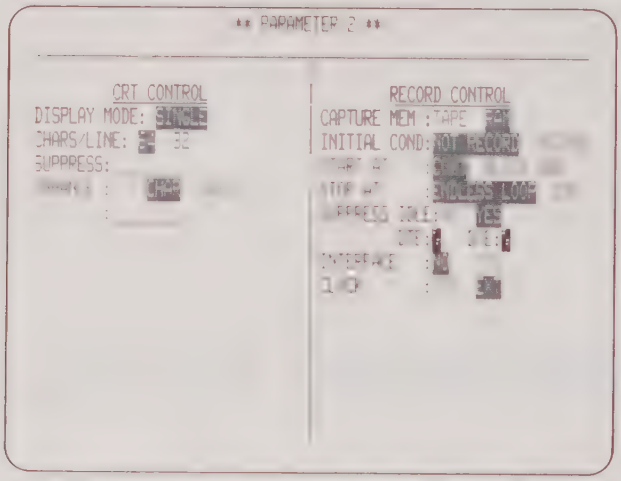

** PARAMETER 2 **
CRT CONTROL
DISPLAY MODE: SINGLE
CHARS/LINE: 32
SUPPRESS:
RECORD CONTROL
CAPTURE MEM :TAPE
INITIAL COND:NOT RECORD
YES

Figure 33-2

(c) Start At. START AT selections are analogous to those for playback on the Parameter 1 menu (see Section 13.5).

Whether recording begins under trigger or manual control, if CONTinue is selected recording will begin after the last block previously recorded. A block of null characters separates previously recorded data from new data.

When BLOCK=000 is selected, recording begins at the first block, whether or not this entails writing over previously recorded data. You may also choose to start recording at any other specified block by entering the block number (decimal) over the 000. Thus you may avoid writing over old data altogether, or you may choose to write over any number of blocks of old data.

(d) Stop At. STOP AT offers the choice between beginning again at Block 000 when the tape, or RAM, is full, thus writing over previously recorded data (ENDLESS LOOP), or stopping at the last block (END).

(e) Suppress Idle. Idle time between frames may be suppressed to maximize the data storage capacity of the tape. If you wish to suppress idle time, move the RIGHT CURSOR ARROW to YES. Two additional data-entry fields, DTE and DCE, will appear (Figure 33-2). In these fields you will make the appropriate entry for the protocol involved. These entries may be characters (usually control characters) or hexadecimal.

Idle time between frames will only be suppressed when COMSTATE II has seen sixteen contiguous idle characters on both sides of the line simultaneously.

If Suppress Idle has been selected, it cannot be overridden by manual control of recording (Section 33.3), so even if MEM MAN START is pressed, idle characters will continue to be suppressed.

(f) Interface. This selection is only valid for tape; the RAM will not record interface status. When INTERFACE:YES is selected, the status of six RS-233/V.24 leads (RTS, CTS, DSR, RLSD, DTR, RI), the user-assigned lead (if it has been strapped to an interface lead), and the ENTER key (marker; see Section 19.16) are automatically recorded. During playback, the status of the recorded leads is shown on the EIA Status indicator panel.

CAUTION: Data samples on a single tape should be recorded with INTERFACE: YES or NO selected consistently. If data samples are mixed (some with IF leads recorded, some without), playback will halt at the boundary between samples.

(g) Clock. Both tape and RAM will run off either internal or external clock. CLOCK on this menu applies only to the separate Capture Memory receivers and is completely independent of the Clock selection on the Parameter 1 menu, which is for the logic-CRT receivers.

EXTernal clocking may be used when clock is being supplied on the interface. Selecting EXTernal clock then permits recording whether or not data is displayed on the CRT, and whether the data is synchronous or isochronous (ASYNC with external clock).

NOTE: The COMSTATE II will not record off external clock if clock is not being received from both DTE and DCE. This could occur, for instance, when a modem is set for New Sync. In this case, INTernal CLOCK and the correct data speed must be selected.

When clock is not supplied via the RS-233 interface, INT CLOCK must be selected. In this case, be sure to enter the correct data SPEED on the Parameter 1 menu.

Maximum speed for recording on tape is 19.2 kbps (9.6 kbps if interface leads are being recorded). The RAM can record at up to 72 kbps, but external clock should be used above 19.2 kbps, unless optional high-speed crystals are installed (see Section 17.3).

33.3 MANUAL RECORDING: THE CAPTURE MEMORY KEYS

The three Capture Memory keys control recording (and playback) of either tape or RAM, depending on which has been selected on the Record Control (or Parameter 1) menu. You can start or stop recording (or data playback) manually using the MEM MAN START and MEM MAN STOP keys whether or not triggers have been set to control recording. The only way to return the Capture Memory to trigger control, however, is to operate the MEM CONT TRIG key.

To manually record line data into the Capture Memory select Tape or RAM on the Record Control menu (if the RAM option is installed). Then, only two keys are required.

(1) To record on tape, remember to position the tab on the tape to RECORD position (toward the outside edge of the cartridge), before you install it.

(2) Press RUN; then operate the MEM MAN START key in the CAPTURE MEMORY zone of the keyboard.

(3) The RECORD and MANUAL indicators on the status panel will go on and the block number on the first line of the display will increment as each block is recorded.

(4) To stop recording, press MEM MAN STOP.

33.4 TRIGGER CONTROL OF RECORDING

Recording may be started and stopped under trigger control. Check the Record Control selections on the Parameter 2 menu, as the trigger actions will be superimposed on these basic instructions.

On the Trigger Actions menus, select ON or OFF in the SET CAPTURE MEMORY field (see Section 21.12).

In Run Mode, the TRIGGER indicator in the CAPTURE MEMORY zone of the front panel will be ON. The RECORD indicator will flash ON and OFF to indicate the actual status of the recording process as the triggers control it.

33.5 RUN MODE

(a) Status Indicators. The Capture Memory status indicators on the COMSTATE II front panel indicate the status of the tape or RAM, whichever has been selected on the Parameter 2 Record Control menu. While the data is being recorded the RECORD LED is always on. Either the MANUAL or the TRIGGER LED will also be on, to show how the recording process is being controlled.

(b) Recording. During recording, the Capture Memory block number on Line 1 of the display increments for each block received.

Data will be recorded no matter what the data transmission format and whether or not it is being displayed on the CRT, since the COMSTATE II has separate data receivers for the Capture Memory. (See Figure 2-1.)

When the tape or RAM is turned on, the preceding 128 bits (16 bytes in synchronous modes) are automatically recorded too. When it is turned OFF, the following 128 bits are automatically recorded. Therefore, when the Capture Memory is turned off and then on within less than 33 x 8 bits, the data is recorded without interruption. (See Figure 33-3.)

If the PROGRAM key is operated while the tape is recording data, the tape controller automatically records at least one full block of nulls (00, hex).

(c) Manual Override. The MEM MAN START and MEM MAN STOP keys override control by triggers. They also override the Record Control (Parameter 2) menu, but they do not affect the Suppress Idle selection (see Section 33.2e). The MANUAL status LED in the CAPTURE MEMORY zone of the front panel will go ON. To return the tape or RAM to trigger control, press MEM CONT TRIG (CAPTURE MEMORY group). The MANUAL LED will go OFF and the TRIGGER indicator will go ON.

33.6 PLAYBACK FROM CAPTURE MEMORY

(a) Enabling Playback. To play back data from tape or RAM, select TAPE or RAM for SOURCE on the Parameter 1 menu. The START AT field that appears on the next line controls the block at which playback will begin. If you select BLOCK 000, playback will begin at Block 000; you can select any other block by writing over the 000. If you select CONTinue, playback will resume from the current block number. The Parameter 1 CLOCK selection will go away, but the SPEED field remains and should be filled in. The maximum speed for tape playback is 9.6 kbps; for RAM, it is 28.8 kbps.

When the data source is the Capture Memory, TAPE or RAM is displayed on the first line followed by the block number, which will increment during playback just as during recording.

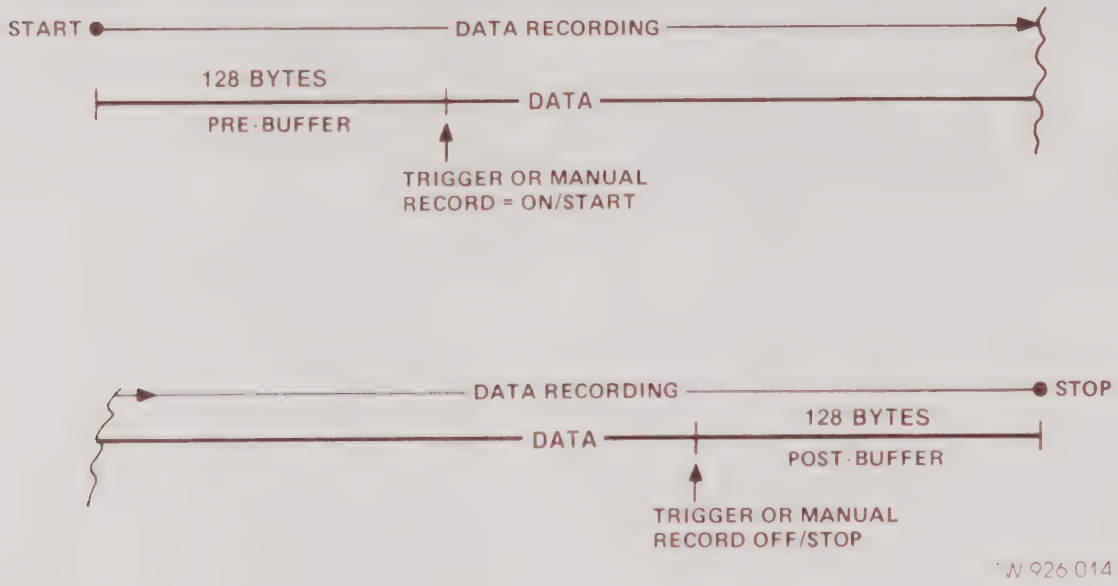

START
DATA RECORDING
128 BYTES
PRE-BUFFER
DATA
TRIGGER OR MANUAL
RECORD = ON/START
DATA RECORDING
STOP
DATA
128 BYTES
POST-BUFFER
TRIGGER OR MANUAL
RECORD OFF/STOP
N 926 014

Figure 33-3

(b) Trigger Control. Playback may be controlled by triggers using the SET CPT MEM action just as for recording. The three MEM keys will also control playback. When playback is stopped with the MEM MAN STOP key, tape motion stops and the block number on Line 1 of the CRT display stops incrementing. The CRT MAN FRZ and HALT keys also stop tape motion.

(c) Emulate Modes. Line data which has been taped or stored in RAM may be played back in either EMULATE mode.

NOTE: It is not advisable to playback character-oriented CRT data in an emulate mode.

The COMSTATE II will display and monitor either TD or RD recorded data but not both.

For example, assume that you are using a tape with TD and RD data. If you select EM DCE, and SOURCE:TAPE, then in Run Mode, the status line will identify the mode as EM DCE, and the source as TAPE. You will not see any RD data from the tape. You will see the TD data from the tape and if you transmit during playback the COMSTATE II's transmissions will appear as RD data. Since you can use the taped TD data to trigger on, this is an excellent tool for developing protocol programs or for protocol training.

NOTE: When TAPE is selected for data SOURCE and EM DTE or EM DCE for MODE on the Parameter 1 menu, data from the tape will be played back on both Emulate connectors: DTE data on the EM DTE connector and DCE data on the EM DCE connector. Only taped data from the side of the line opposite that selected for MODE will be displayed, however.

(d) Altering Playback Speed. During playback from data tape, CRT-data tape, or RAM, the data display may be speeded up or slowed. Each operation of the UP cursor arrow doubles the playback speed to a maximum of 9.6 kbps. Each operation of the DOWN cursor arrow halves the playback speed.

NOTE: Remember that manually altering playback speed will invalidate the timer readings.

(e) Time. During playback from tape the real-time clock value display is overridden by the data-time stamping on the tape. If the trigger Time condition is programmed, the trigger will monitor the date and time recorded on the tape rather than the real-time clock value.

(f) RAM Playback. To play back data from RAM, select SOURCE: RAM on the Parameter 1 menu and enter any speed up to 28.8 kbps. If a high-speed crystal is selected, the ENTERED speed will be used for playback.

During playback from RAM, you may "back up" to the preceding block by pressing the LEFT cursor arrow. There is about a 1-second delay before playback resumes from the previous block. If during this delay you press the LEFT cursor arrow several times in rapid succession, the playback will back up by that number of blocks. If you back up from the beginning of memory, the playback will "wrap around" to the end of memory. Until playback actually resumes, FF (hex) will be sent to the CRT buffer.

Another advantage to the 1-second delay is that it gives you time to clear the CRT with the CLEAR CRT key before the playback resumes.

33.7 ERROR MESSAGES

The COMSTATE II can display a number of error messages concerning tape and RAM operation. These messages and their probable causes are included in Appendix D.

34
CAPTURE OF CRT DATA

The COMSTATE II can store, play back, reanalyze, or transfer CRT data which is temporarily stored in its buffer. The CRT buffer has a 64 kilobyte capacity and can hold approximately 32,000 characters, plus 32 kilobytes of attributes. This translates as 1024 lines of data (with 32 characters per line).

When the COMSTATE II monitors incoming information or performs an interactive test, the data is stored as it is displayed, in character format with time relationships accurate to within one character. Original enhancements are retained with the data; however, any characters which were suppressed when the data was originally captured in RUN mode are not saved in the buffer.

NOTE: Data at the beginning of the buffer is overwritten once the buffer has been filled.

NOTE: Be aware that freezing the screen in RUN mode informs you of the current number of the screen's top line with relation to the beginning of the buffer. Once the buffer is full, the relative number of this line changes, although the same data may still be displayed at the top of the screen. This means that if you freeze the screen at random once the buffer is full, the line number shown may range from 996 to 1024.

NOTE: The entire CRT buffer is flushed when the RUN key is pressed, when the CLEAR CRT key is pressed in Run Mode, or when the unit is turned off.

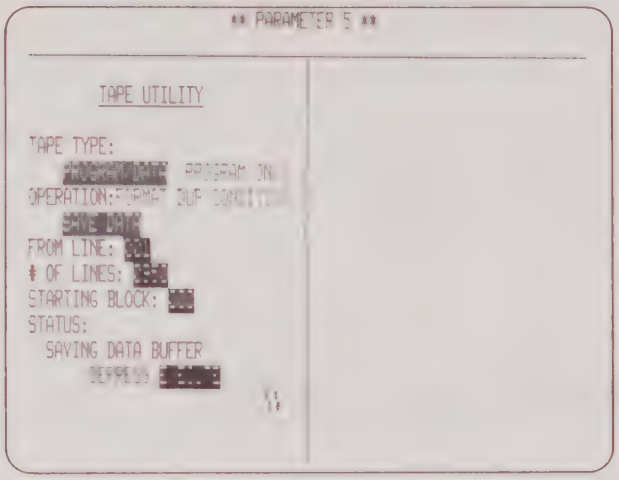

** PARAMETER 5 **
TAPE UTILITY
TAPE TYPE:
OPERATION:
FROM LINE:
OF LINES:
STARTING BLOCK:
STATUS:
SAVING DATA BUFFER

Figure 34-1

34.1 SAVING CRT DATA ON TAPE

Before CRT data can be reviewed or reanalyzed, it must be saved on tape. This process is controlled on the Parameter 5 menu. To save the current contents of the buffer on tape, perform the following steps:

(1) Insert a formatted Program-Data tape in the tape drive. To write-enable the tape, push the black tab toward the outer edge of the cartridge. (If the tape is not formatted, refer to the instructions in Section 32.5.)

(2) Call the Parameter 5 menu to the screen. (Press the PROGRAM key, the PARAM key, and the 5 key in succession.)

(3) Select TAPE TYPE: PROGRAM/DATA and OPERATION: SAVE DATA. Next, enter the number of the first line you wish to save after FROM LINE. (Valid entries are 000 to 1024.) Enter the range of lines to be transferred after # NUMBER OF LINES. (Valid entries are 001 to 1024. Lines are considered to be 32 characters long.) If no range is given, one line of data will be saved. Also enter the number of the STARTING BLOCK; that is, the location on tape where recording is to begin. (By default recording begins at Block 000.)

When ready, press the XEQ key. The messages CHECKING TAPE TYPE, POSITIONING TAPE, and SAVING DATA BUFFER will appear in succession in the STATUS area. Two columns of hexadecimal digits will appear at the lower right of the screen. These represent the number of data blocks remaining to be transferred to tape. (See Figure 34-1.) The digits will decrement as the process continues. When the data specified has been saved, the message (NUMBER) BLOCKS SAVED will appear in the status area.

If an error occurs during taping, an identifying message will appear in the STATUS area. Error messages are explained in Appendix D.

34.2 USES OF CRT DATA

Once CRT data is stored on tape in the COMSTATE II, it can be played back and monitored or reanalyzed. For a further description of playing back and reanalyzing CRT data, refer to Section 11.

CRT data can be sent to a remote INTERVIEW device either directly from the COMSTATE II CRT buffer or from tape. The COMSTATE II can also receive CRT data from another INTERVIEW and store the data on tape in one step. These processes are explained in Section 50.

35
RAM-TAPE DATA TRANSFER

If a High-Speed Memory option (RAM) is installed in the COMSTATE II, you may transfer part or all of the content of RAM to the tape, or vice versa, using the RAM-Tape Xfer Control menu on the Parameter 3 screen (Figure 35-1). This menu will not appear unless RAM is present. Recorded programs cannot be transferred, since the RAM does not store programs.

The block lengths and numbering of tape and RAM correspond, but notice (see Table 25-1) that there are fewer blocks in RAM than on the tape and also the last block of RAM is a partial block.

(1) If you wish to transfer data to the tape, remember to position the tab on the cartridge to the RECORD position.

CAUTION: The transfer logic does not check tape type and it will record over any program-data or multiple-program tape.

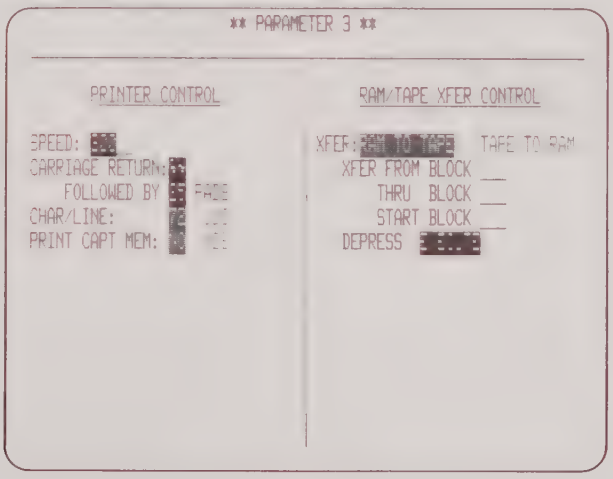


Figure 35-1

(2) Display the Parameter 3 menu.

(3) Select the direction of transfer, RAM TO TAPE or TAPE TO RAM. The default direction is RAM TO TAPE.

(4) Enter the block number from which you wish transfer to begin (XFER FROM BLOCK ___) and then the block number at which you wish it to stop (THRU BLOCK).

NOTE: All block numbers must be entered as three-digit numbers.

(5) Enter the block number at which you wish recording to begin (START BLOCK ___).

(6) To execute these instructions, press the XEQ key while the Parameter 3 menu is still displayed. The tape will move to the selected block before transfer begins.

If the RAM has been told to go to a block number beyond the end of memory, the following message will appear:

```
MEMORY BLOCK NOT FOUND MAX BLK #  XXX
```

This can occur in RAM-to-Tape transfer if the "XFER FROM" block number is too large, or in Tape-to-RAM transfer if the "START BLOCK" is too large.

You can verify that the transfer is in progress by watching the number of blocks increment on Line 2 in the message XFER IN PROCESS: XXX BLOCKS TRANSFERRED. The time required for transfer is determined by the time it takes the tape to reposition itself and record or play back the data.

Transfer is followed by one of three messages on Line 2:

```
XFER COMPLETE: XXX BLOCKS TRANSFERRED
END OF MEMORY: XXX BLOCKS TRANSFERRED
TAPE STOPPED @ END: XXX BLOCKS TRANSFERRED
```

If interface lead status has been recorded on the tape, the status information will be stripped out during the tape-to-RAM transfer. Thus the data in one block of tape containing interface samples will occupy only about two-thirds of a block of RAM.

NOTE: If the data in RAM has been transferred from a tape containing interface samples, any resulting partial block in RAM will be filled out with nulls.

The transfer will not proceed beyond the last block of the destination, whether tape or RAM. If end of tape is found before the transfer is complete, the COMSTATE II will display the message TAPE STOPPED @ END.

You may transfer from any block of RAM to any preceding block. The transfer will proceed to the end of the memory and then wrap around to Block 000. If, for instance, you transfer Blocks 002 through 001 of the 4-Megabit RAM (see Figure 35-2) to tape, the tape will record 218 full blocks of data and the 219th block will be padded out to a full block with nulls (see Figure 35-3) because the 219th block of 4-Megabit RAM (Block 218) is a partial block.

A transfer from the tape to RAM will wrap around also.

If you do not enter block numbers on the Parameter 3 menu, the COMSTATE II will display an error message.

If you transfer any portion of RAM that has not been recorded, "garbage" characters may appear on the tape (for example, nulls, self test data, or old data).

The COMSTATE II can display a number of error messages concerning tape and RAM operation. These messages and their probable causes are included in Appendix D.

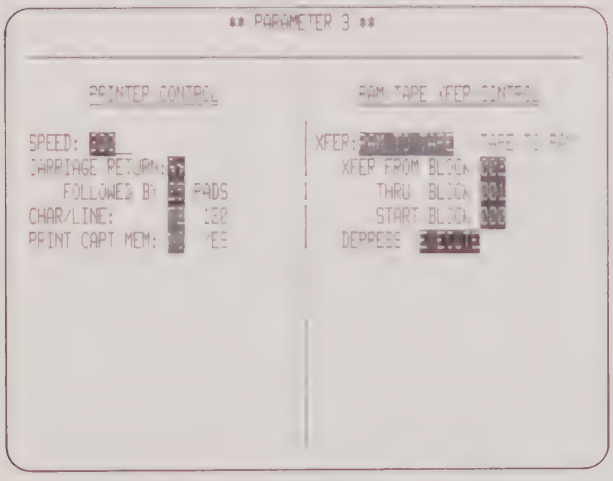


Figure 35-2

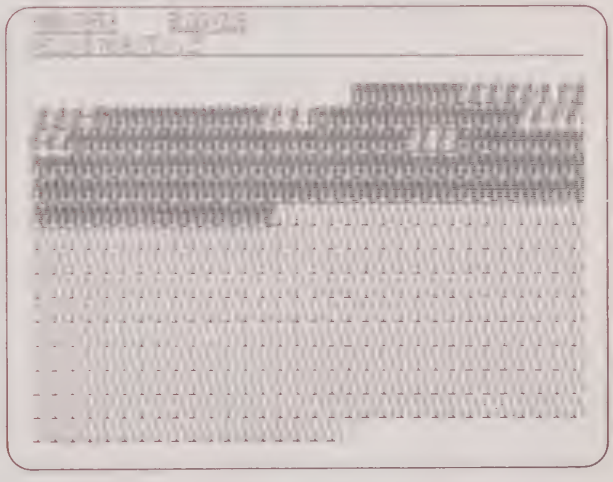


Figure 35-3

36
CAPTURE MEMORY: SAVING AND LOADING PROGRAMS

Tapes must be formatted before they are used in the COMSTATE II. They may be prepared in one of two formats: program-data or multiple-program (select PROGRAM ONLY on the Tape Utility menu). A program-data tape can save data and a program. However, the size of the program that can be saved is limited to five triggers, and to no more than five named states.

NOTE: If a user code is established but no constants are used, the program should contain no more than four triggers and four named states. If constants are defined, it should contain a maximum of three triggers and three named states, whether or not a user code is defined.

A multiple-program tape can store up to 100 blocks. Depending on the number of Triggers and States, a program may occupy between one and ten blocks on a multiple-program tape. The optional High-Speed RAM does not record programs; nor are programs saved with CRT data. Formatting instructions are given in Section 32.5.

CAUTION: COMSTATE II programs can only be saved properly to a tape that has been formatted on a COMSTATE II or a 4600 with a Software Version of 12.02 or above (31.02 or above if multilayer boards are installed). If it has been formatted on an older 4500/4600, reformat the tape before saving a COMSTATE II program to it.

36.1 SAVING A PROGRAM ON A PROGRAM-DATA TAPE

CAUTION: If you wish to verify that a program on a tape is no longer of interest, it must be checked before the program to be saved is developed in the COMSTATE II. This avoids writing over the new program with the taped program.

(a) Checking the Tape. To ascertain that the program on a tape is no longer of interest, insert the tape with the tab in the protected position. Press the PROGRAM and LOAD PROG keys: the Tape Load/Save menu will be displayed. When the tape has been searched, the name of any resident program will be shown on the Test ID line. If no program is read, NO PROGRAM/DIRECTORY FOUND or PROGRAM VERSION NOT SUPPORTED will be displayed.

Remove the tape cartridge and develop the desired program in the COMSTATE II.

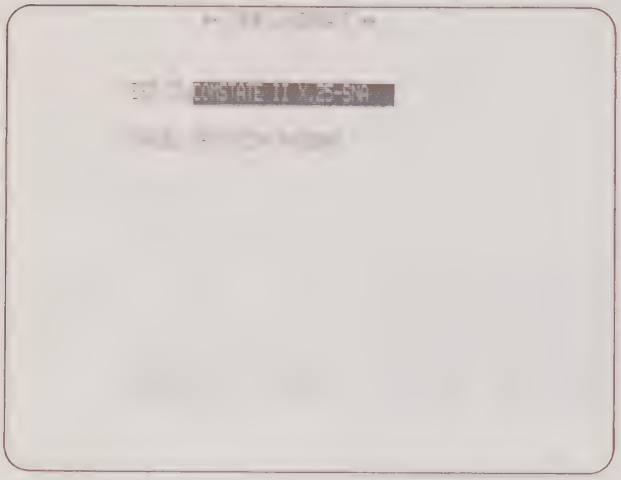


Figure 36-1

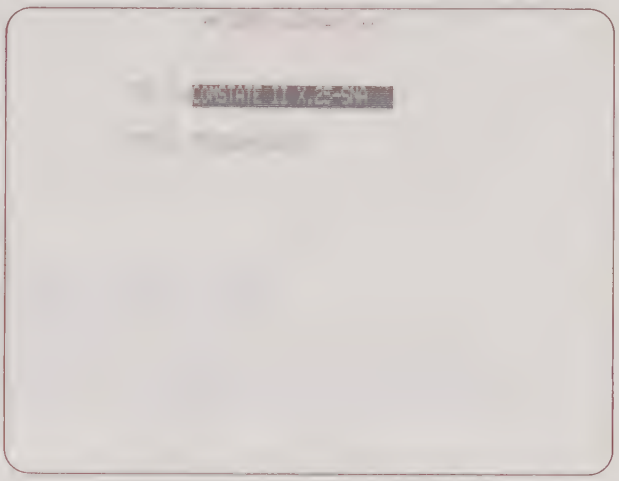


Figure 36-2

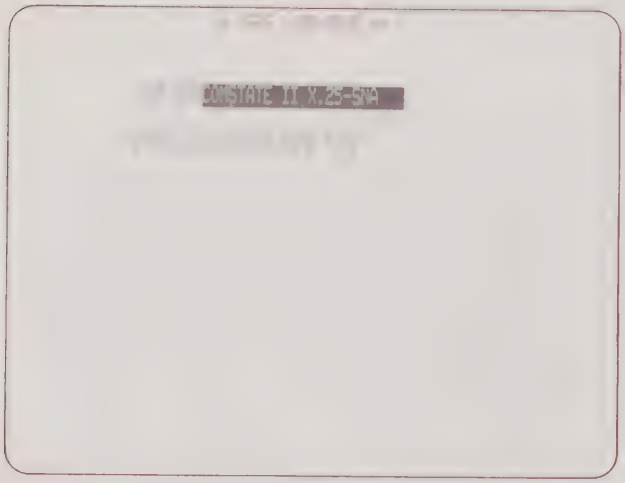


Figure 36-3

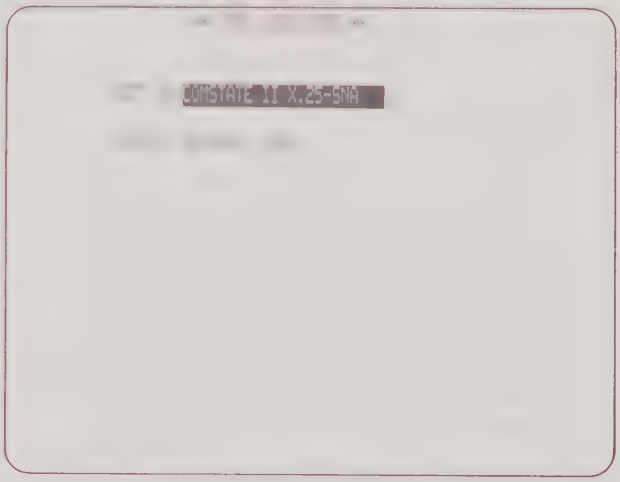


Figure 36-4

(b) Saving the Program. Using a maximum of five triggers (and no more than five named states), develop the program that you wish to save in the COMSTATE II; then use the following procedure to save it.

(1) Position the tab on a formatted program-data tape cartridge to RECORD (toward the outside of the case) and insert it in the COMSTATE II.

(2) Press the SAVE PROG key. The COMSTATE II will display the Tape Load/Save menu (Figure 36-1). If a Test ID for the program has been entered on the Parameter 1 menu, it will be displayed in the Test ID field of the Load/Save menu. On the Status line the message CHECKING TAPE TYPE will be displayed. If the tape has not been formatted, the COMSTATE II will not proceed. When the tape type has been found, the messages SAVING PROGRAM, VERIFYING PROGRAM, and then PROGRAM SAVED will be displayed successively (Figure 36-2).

If you attempt to store a program longer than one block (or five triggers) to a program-data tape, this error message will appear: PROGRAM TOO LONG. Use a program-only tape for such programs.

(c) Verifying the Saved Program. Verify that the program has indeed been transferred to the tape as follows:

(1) Operate the LOAD PROG key. The Tape Load/Save menu should show the Test ID.

(2) Verify the Parameter 1 and Parameter 2 menus, the Trigger and Message menus, and the Statistics display.

(d) Labeling the Tape. Remove the tape and position the tab toward the center of the case to protect the contents. Fill out a label with the program title and parameters. Prefold the label on the perforated line before peeling it off the backing; then attach it to the cartridge.

(e) Bypassing the Tape Type Check. You may save the program in the unit on tape without checking tape type by pressing the CTRL and SAVE PROG keys simultaneously. The COMSTATE II will assume that a program-data tape is installed and save the program without checking for tape type. The program will be saved in the program area according to the program-data format.

This procedure is intended to be used for a program-data tape on which a Program Write Error has occurred during a program Save. Since the COMSTATE II will not write over an unrecognizable tape type, and an incorrectly written program is unrecognizable, CTRL-SAVE PROG must be used if the tape data is to be retained. It would be lost if the tape were reformatted.

CAUTION: If CTRL-SAVE PROG is used with a multiple-program tape, the directory will be overwritten.

36.2 LOADING A PROGRAM FROM A PROGRAM-DATA TAPE AFTER POWER-UP

Press the PROGRAM key. This places the COMSTATE II in the Program mode and displays the Program Selection menu.

Press the LOAD PROG key, which will display the TAPE LOAD/SAVE menu. The COMSTATE II will first check the tape type, displaying the status message CHECKING TAPE TYPE (Figure 36-3) before LOADING PROGRAM. When the program has been LOADED, the Test ID will be displayed, with the message PROGRAM LOADED (Figure 36-4).

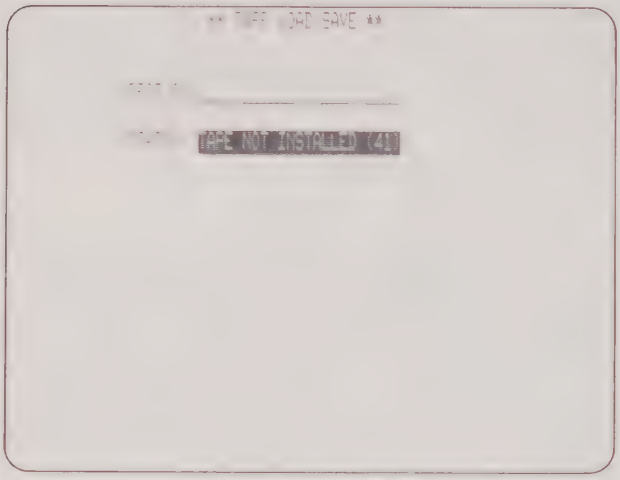


Figure 36-5

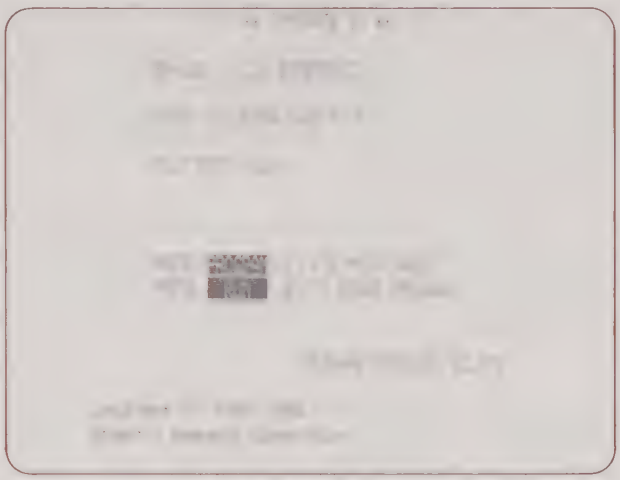


Figure 36-6

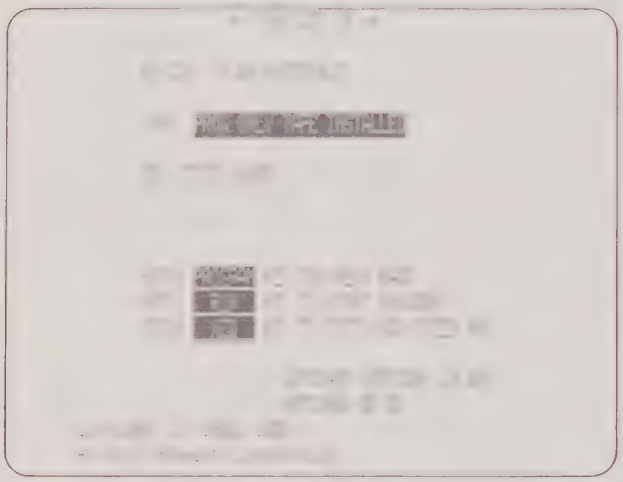


Figure 36-7

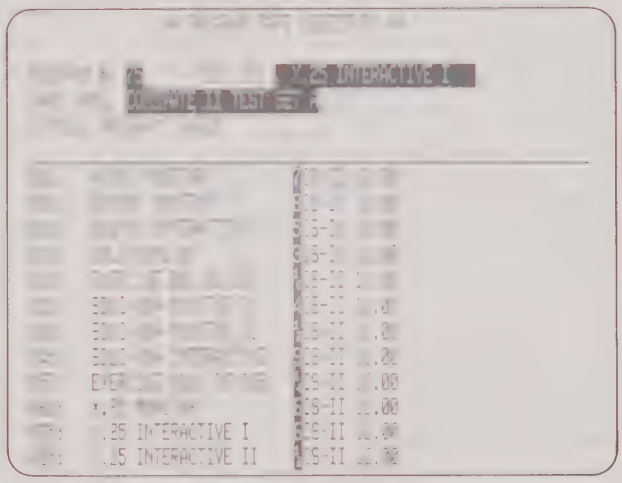


Figure 36-8

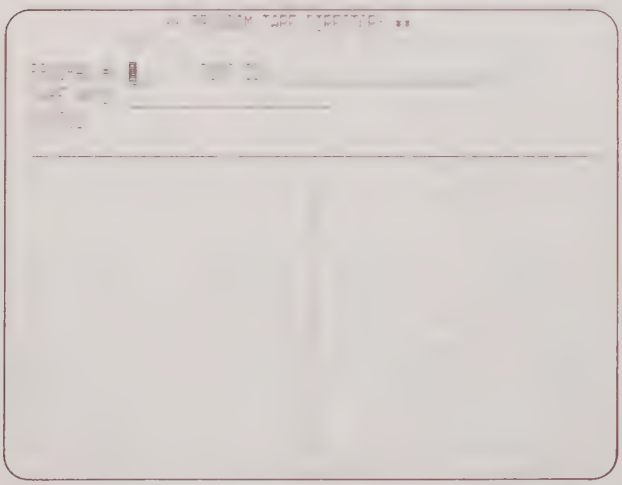


Figure 36-9

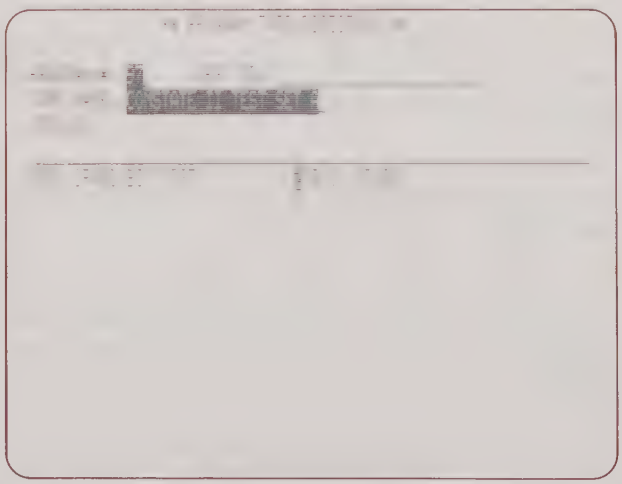


Figure 36-10

If the COMSTATE II cannot load a program, a status message will be put up (as in Figure 36-5). See Appendix D for a list of the messages that may be displayed concerning the Capture Memory.

36.3 LOADING A PROGRAM AUTOMATICALLY AT POWER-UP

If a program-data tape containing a compatible program is inserted in the tape drive before the COMSTATE II is turned on, the COMSTATE II will load the program automatically when the internal self tests are finished. The message CHECKING TAPE TYPE (see Figure 36-6) will appear on the TAPE line of the power-up menu while the COMSTATE II checks whether a program-data or a multiple-program tape is present. If a program-data tape is present, it is searched for a test program in its protected location. The program is then automatically loaded and its ID displayed on the power-up menu. The COMSTATE II then goes automatically to Run mode and looks for data in accordance with the program.

If a multiple-program tape is found, the TAPE line will display PROGRAM TAPE INSTALLED (Figure 36-7); if no program is found on the tape, the message will be NO PROGRAM/DIRECTORY FOUND. In either case, the unit will remain in Program mode.

36.4 MULTIPLE-PROGRAM TAPES: THE TAPE DIRECTORY MENU

If, when the LOAD PROG or the SAVE PROG key is pressed, the logic finds that a multiple-program tape is installed, the Tape Load/Save menu will be briefly displayed with the Status message CHECKING TAPE TYPE; then the Program Tape Directory menu (Figure 36-8) will be displayed. If the COMSTATE II finds a multiple-program tape installed at power-up, it will display PROGRAM TAPE INSTALLED on the TAPE line of the power-up menu (Figure 36-7).

(a) Menu Fields. In the PROGRAM # data-entry field is the decimal number of the first available block on the tape. The PROGRAM # will actually be the first block number in which the program is written. If the tape is either empty (Figure 36-9) or full, the Program # displayed will be 1. The TEST ID line shows the title of the program that is in the unit waiting to be saved, if the Test ID field on the Parameter 1 menu has been filled in. The Tape Name line identifies the tape, if the tape has been previously named.

Below the menu selections is the Program Directory itself, with the list of the program numbers and IDs of all programs on the tape, and the number of blocks used to store the program. Up to 12 of the programs on the directory may be displayed at one time. To see the next page of the directory, use CTRL plus the DOWN cursor arrow. Use CTRL plus the UP arrow to return to the previous page. (Compare Figure 36-10 with Figure 36-8).

(b) Revising the Directory. To erase any program from the directory, enter the number of the program in the PROGRAM # field and press CTRL-CLEAR FIELD. That program title will be deleted from the directory, although the program itself will remain on the tape until it is overwritten.

The Program Directory will automatically be revised and saved each time you save a program.

(c) Tape Name. If the tape has been given a name, it will appear on this line. You can name, or rename, the tape simply by typing in the name on this line before you save a program: the tape name will automatically be saved at the same time as the program and the directory. The tape name will then be saved with the revised directory each time you save a program.

To save only the Tape Name and the Tape Directory, enter a Ø (zero) in the Program # field and press the SAVE PROG key.

(d) Multiple-Program Tape Enhancements. In addition to COMSTATE II programs, programs from the following devices can be stored: the INTERVIEW 30, 40, COMSTATE I, 3500, 3600, 3900, 4500, 4600, and 20R.

Of these program types, only 4600 programs can be loaded into the COMSTATE II (see specifications, section 36.7). However, other program types can be forwarded as needed to compatible units via Remote Transfer (see Chapter 47).

Supplementary information on the Program Tape Directory helps identify the varied program types (see Figure 36-11). The type of device on which the program was originated or modified as well as the software version of that device are listed beside the program name. Starting address and program length are also given.

NOTE: Although a program may not have been modified manually when loaded into a unit, the program may nonetheless have been altered if the receiving unit contained older software. The Program Tape Directory of the new COMSTATE II will reflect possible program modifications by displaying the software version of the last unit into which the program was loaded and saved.

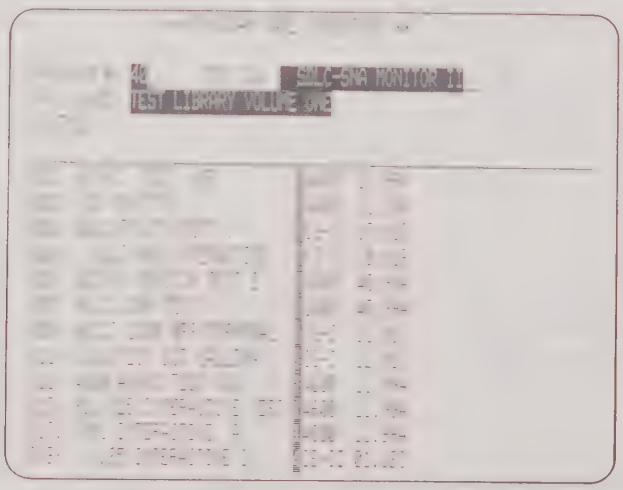


Figure 36-11

NOTE: Programs from a tape formatted in a COMSTATE II with Software Version 10.02 or above cannot be loaded into a COMSTATE II with an older software version. (Typically, the message DIRECTORY VERSION NOT SUPPORTED or INCORRECT PROGRAM NUMBER will appear if this is attempted.) However, programs can be loaded from a tape with an older format into a COMSTATE II of a higher (more recent) software version.

36.5 RECORDING A PROGRAM ON A MULTIPLE-PROGRAM TAPE

It is preferable to record your program in the default record posted on the PROGRAM # line. Although the program may not be stored sequentially, it will be saved in the most efficient manner for tape usage. To record a program in the position assigned by COMSTATE II, simply press SAVE PROG. The status line will display the following successive messages:

SAVING PROGRAM.

SAVING BLOCK (for each block required).

VERIFYING BLOCK (for each block required).

SAVING DIRECTORY.

VERIFYING DIRECTORY -- If the directory has not been recorded correctly and cannot be verified, this message will be replaced by DIRECTORY WRITE ERROR.

PROGRAM SAVED.

When this sequence is finished, the new program will have been recorded and also added to the directory.

It is possible to assign a number to a program you wish to save by writing over the default record number on the PROGRAM # line before you press SAVE PROG. You must, however, use either a previously specified program number or a previously unused block number. If you specify a block number another program is written in, the Status Line will display the message BLOCK UNAVAILABLE.

36.6 LOADING A PROGRAM FROM A MULTIPLE-PROGRAM TAPE

(a) Using the Tape Directory Menu. Insert the tape with the tab in the Protected position and press the LOAD PROG key. The Tape Load/Save menu will be displayed with the status message CHECKING TAPE TYPE.

If a Program-Only tape has been inserted, CHECKING TAPE TYPE will change to LOADING DIRECTORY momentarily and then the Program Tape Directory menu will be displayed. On the Program # line will be the number of the first blank record on the tape; on the Test ID line, the ID of the program currently in the unit, if there is one. (Notice that the directory menu does not distinguish between the Load and Save modes.)

Select the program you wish to load by entering its number on the Program # line and press LOAD PROG. LOADING PROGRAM will be shown on the Status line; then PROGRAM LOADED; then the name of the program will come up on the TEST ID line.

NOTE: With Software Version 10.02 and above, the COMSTATE II will load and run any COMSTATE II program, no matter what the software version of the program. Be aware, however, that more recent features of program software which the COMSTATE II does not recognize will be ignored. This may alter the characteristics of the program, but only as long as the program resides in the older unit.

(b) Bypassing the Program Tape Directory Menu. If you press the CTRL and the LOAD PROG keys simultaneously after inserting a Multiple Program tape, you will be shown a blank Program Tape Directory Menu. This allows you to load programs from a multiple-program tape whose directory has been lost. This may also be used as a fast method to load a program from a multiple-program tape if the program record number is known.

(c) Updating the Program Tape Directory. The Program Tape Directory is stored in memory once PROGRAM, then LOAD PROG have been pressed. For as long as the tape is installed, the directory can be called immediately from memory simply by pressing the LOAD PROG or SAVE PROG key. If a new tape is inserted, the directory is not updated immediately. However, the COMSTATE II protects the integrity of the new tape. If an attempt is made to SAVE a program when a new tape is installed but the directory has not been updated, the message DIRECTORY NOT FROM THIS TAPE appears. If an attempt is made to LOAD a program number which appears on the directory, but does not exist on the newly-installed tape, the message NO PROGRAM FOUND will appear. (If the program number happens to be an accurate program address for the new tape, the program will load, however.) To update the directory, press PROGRAM followed by either the LOAD PROG or SAVE PROG key. Then proceed with the LOAD or SAVE operation.

36.7 LOADING INTERVIEW 4500/4600 PROGRAMS

INTERVIEW 4500/4600 taped programs may be loaded into the COMSTATE II. Each bank of triggers will be loaded into a separate state. If the tape is inserted at power up, the low bank will be loaded in Test A, State 0 and the high bank will be loaded in Test A, State 1. It is possible to select which test and state the 4500/4600 program will be loaded in by pressing the desired STATE TEST key and entering the number of the state you wish. (In this way you may string together 4500/4600 programs to yield a composite COMSTATE II program.) If you load a program after power up, the low bank will be loaded into the test and state where the pointer is. Should State 127 be selected, the low bank would be loaded in State 127 and the high bank in State 0; it will not go into the next test.

> NOTE: Loading a 4500/4600 program does not clear the test currently loaded in the COMSTATE II. If a test is currently loaded, clear it before you attempt to load the 4500/4600 program. Press STATE TEST B, CTRL-CLEAR FIELD, STATE TEST A, CTRL-CLEAR FIELD. (It is not necessary to clear other Parameter screens or the Message Buffer.)

Certain modifications may be necessary in order for a 4500/4600 program to run correctly in the COMSTATE II. Any Prompts in the 4500/4600 program must be reentered in the PRMT fields of the COMSTATE II trigger Actions menus. The prompt texts must then be deleted from the Message-Entry menus, and the corresponding menu number deleted from the trigger TEXT lines. Also, any message text which exceeds the 180-character maximum in the COMSTATE II will be truncated. Because of the different size of the Message-Entry Menu text field, messages may no longer be aligned in the same manner on the menus in the COMSTATE II.

(See also the caution in Section 36.1 concerning tapes that have been formatted on a 4500/4600.)

37
DUPLICATING TAPES

CAUTION: If the unit used for duplicating has the High-Speed Memory option (RAM, OPT 05), its data content will be overwritten during tape duplication.

37.1 FORMATTING AND CONDITIONING

The COMSTATE II will copy the formatting of the source tape during duplication and pad out any empty blocks at the end of the destination tape. The destination tape will be retensioned automatically during the duplication process.

37.2 DUPLICATION PROCEDURE

On the Tape Utility menu (Parameter 5), select PROGRAM/DATA or PROGRAM ONLY (for a multiple-program tape); then select DUPlicate (Figure 37-1). Set the tab on the SOURCE tape (that is, the tape you want to copy) to the inside, or PROTECTED, position; set the tab on the DESTINATION tape (that is, the new tape) to the outside, or RECORD, position.

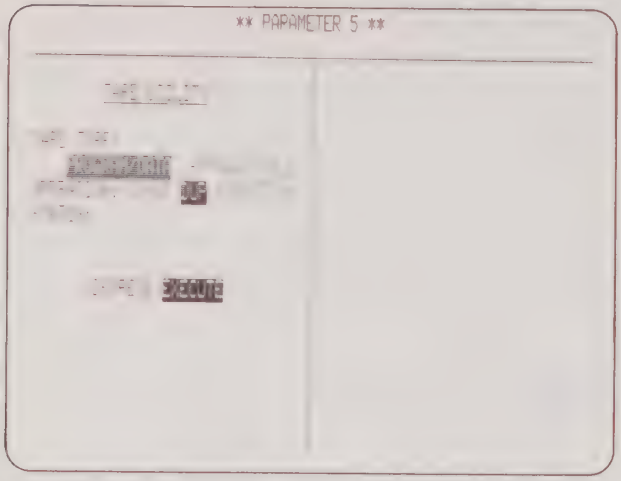


Figure 37-1

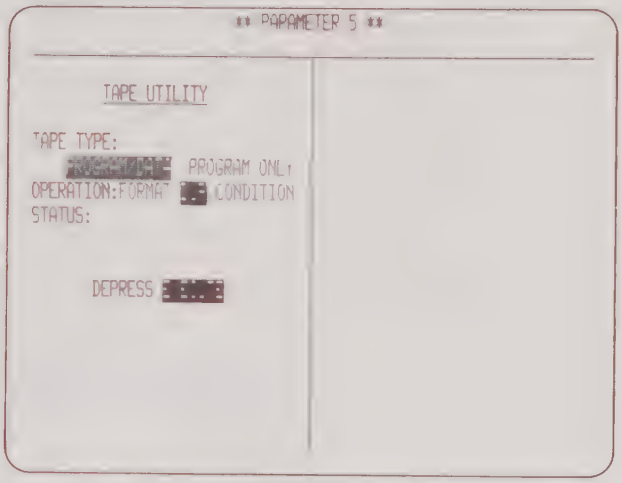


Figure 37-2

Install the source tape. Press the XEQ key. The message DUPLICATING TAPE will appear on the Status line and then the COMSTATE II will use line 2 to ask you (see Figure 37-2) to

REMOVE SOURCE (WRITE PROTECTED) TAPE.

If there is no tape in the drive when you press XEQ, the COMSTATE II will use Line 2 to ask you to

INSERT SOURCE (WRITE PROTECTED) TAPE.

If the tape in the unit has the tab in the RECORD position, the COMSTATE II will assume it is not the source tape and ask you to

REMOVE DESTINATION (WRITE ENABLED) TAPE

and then, once you have removed the tape, to

INSERT SOURCE (WRITE PROTECTED) TAPE.

When the source tape has been acknowledged and removed, line 2 will ask you to

INSERT DESTINATION (WRITE ENABLED) TAPE.

When the destination tape has been inserted,

FORMATTING DESTINATION TAPE

will be displayed on line 2. Formatting will take 2 minutes or so; then you will be asked to

REMOVE DESTINATION (WRITE-ENABLED) TAPE

Remove the destination tape; then you should INSERT SOURCE (WRITE PROTECTED) TAPE. When the COMSTATE II has copied as much as it can from the source tape to temporary storage it will ask you again to insert the destination tape. After all the temporarily stored data has been transferred to the destination tape, you will be asked to insert the source tape again.

Thus, the COMSTATE II will guide you through the number of tape swaps necessary to copy the entire tape onto the destination tape. If your COMSTATE II has a High-Speed Memory (RAM option), it will automatically use it to store the content of the source tape. With the 1-Megabit RAM, a maximum of 5 tape exchanges will be required; with 4-Megabit RAM, a maximum of 3 exchanges. Without RAM, up to 101 tape exchanges may be required.

When the process has been completed, TAPE DUPLICATED will appear on the Status line.

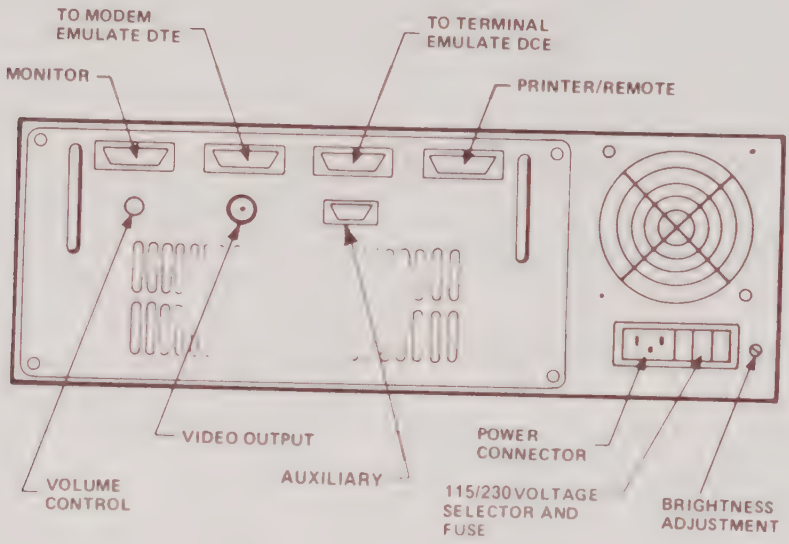

TO MODEM
EMULATE DTE
TO TERMINAL
EMULATE DCE
MONITOR
PRINTER/REMOTE
VIDEO OUTPUT
POWER
CONNECTOR
AUXILIARY
VOLUME
CONTROL
115/230 VOLTAGE
SELECTOR AND
FUSE
BRIGHTNESS
ADJUSTMENT

Figure 38-1

38
PRINTER CONTROL

The COMSTATE II will control most asynchronous ASCII printers. You may print not only static displays -- frozen data displays, frozen frame or packet protocol trace displays, prompt/state trace displays, statistics, and all program menus except the summaries -- but also any data or frame or packet protocol as it is being played back from tape or RAM.

NOTE: Your printer must be set to the top of form in order for the status lines (Lines 1 and 2 of the CRT display) to be printed at the top of each page.

38.1 INTERCONNECTION

There is a separate female RS-232/V.24-type PRINTER/REMOTE interface connector on the rear of the COMSTATE II for connection to a printer (see Figure 38-1). The COMSTATE II transmits to the printer on Pin 3 (RD). The COMSTATE II also applies an ON voltage (+12 V) on Pins 5 (CTS), 6 (DSR), and 8 (RLSD). It monitors Pin 20 (DTR). When DTR goes OFF the COMSTATE II stops transmitting on Pin 3. When DTR goes back ON, the COMSTATE II resumes transmitting. Information is transmitted in even-parity ASCII (7 information bits), and responds to X/ON-X/OFF control

characters. (CONTROL-S produces a DC3 control character which represents an X/OFF command. CONTROL-Q produces a DC1 control character which serves as an X/ON command.) Your printer should be set to receive information in this format.

38.2 PRINTER CONTROL MENU

The Parameter 3 Printer Control menu (Figure 38-2) must be filled out before you attempt to print any display.

(a) Printer Speed. In this data-entry field, you set the COMSTATE II to match the speed of your printer. The default value is 300.

(b) Carriage Return. In the first data-entry field on this line, insert the carriage-return character or characters appropriate for your printer. The default characters are the ASCII control characters CR LF. In the second field, insert the number of pad characters that must follow the carriage return instruction in order to give the printer time to perform the carriage return. The default value is 25 pads.

(c) Characters per Line. Select the number of printed characters per line. The choices are 72 (the default value) and 120. If your printer's line length is 72 characters or less, choose 72. If your printer's line length is greater than 72 and less than 120, choose 120. The COMSTATE II will not output more than 120 characters per line.

(d) Print Capture Memory. This field is valid if TAPE or RAM has been selected as data source on the Parameter 1 menu. The default selection is NO. If you select YES, then the content of either tape or RAM, whichever was selected on the Parameter 1 menu, will be printed when the unit enters Run Mode.

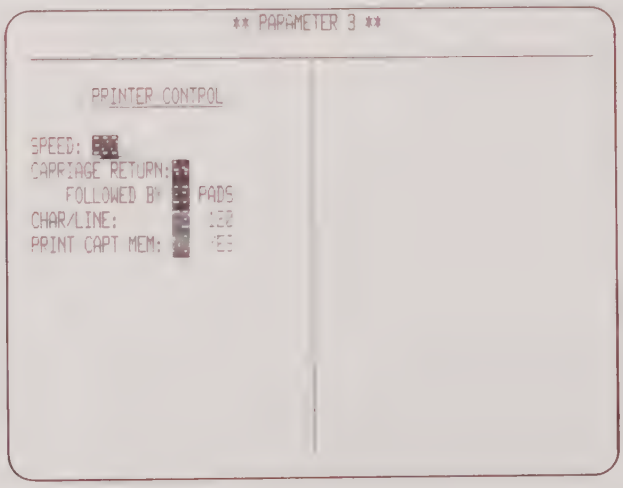


Figure 38-2

38.3 PRINTOUT PROCEDURES

(a) Static Displays. To obtain a printout of any allowed static display, fill out the Parameter 3 menu, display the material to be printed, and press the PRINT key. The display will automatically be printed. Press PROGRAM to abort a print (depending on the size of your printer's data buffer, there may be a delay of several lines before printing stops).

The static displays that can be printed are program menus, frozen data and frame or packet protocol displays, prompt/state or prompt displays, the Statistics display, and spread-sheet displays. The Trigger and Message Summaries, State Summary, and Self Test display cannot be printed. Data displays cannot be printed from Halt Mode.

You may print groups of menus as follows:

(1) Display the Program Selection menu (press the PROGRAM key) to print the entire program presently in the unit, including all default menus.

(2) Press PARAM, then PRINT, to print the Parameter 1, 2, and 4 menus.

(3) Display the State Summary for Test A or Test B to print all trigger Conditions and Actions menus in that test.

(4) Display the Message Summary to print all message menus.

(5) Press SPRD SHEET, then CTRL-PRINT, to print both Test A and Test B in spread-sheet format. (Constants are also included.) See Figure 27-9 for an example of a spread-sheet printout.

(b) Capture Memory Playback. To print the data content of either Tape or RAM, select TAPE or RAM as source on the Parameter 1 menu, and CAPTURE MEMORY: YES on the Parameter 3 menu. Press the RUN key, and the data will automatically be printed as it is played back from the block selected on Parameter 1. The tape or RAM playback speed selected on Parameter 1 will be overridden by the Printer Speed selected on Parameter 3.

38.4 PRINTED FORMAT

(a) Program Menus. Most program menus can be adequately represented by 72 character-per-line printouts. The printout will correspond 1:1 with most characters on the display. However, each character in a data-entry field is allotted three positions on the printout. This prevents control characters from being read by the printer and allows special characters such as hexadecimal or bit masks to be represented with standard alphanumeric characters. The symbols used for these and other characters are defined in Table 38-1.

Figures 38-3 and 38-4 are printouts of the trigger menus shown in Figures 38-5 and 38-6. Figure 38-7 shows how each text-entry line on a Message Entry menu will be printed on two lines on a 72-char/line printout.

Although control characters can be entered in the Test ID field on the Parameter 1 menu, a control character in that field will be printed out as a space.

TABLE 38-1
SPECIAL CHARACTER REPRESENTATIONS ON PRINTOUTS

CRT Display	Printout
Normal characters	Character is preceded by and followed by a space.
Special characters: 7E (Flag), Bit Mask, G or B (BCC), A (Abort), DC (Don't Care)	Character representation (one or two printed characters) is preceded by a colon.
Don't Care	:DC (upper case)
Not Equal (bar through character)	- (dash) precedes character. (equal sign) replaces the colon preceding special characters.
Control characters	Lower-case mnemonic (displayed as a space followed by two lower-case printed characters)
Hexadecimal characters	Displayed as a space followed by two printed characters

```
** TRIGGER 0 CONDITIONS **

ENTER STATE:  NO
LINE:  NEITHER
TIMEOUT:  NO
XMT CMPLT:  NO
TIME:  NO
KYBD:  NO
NS REC ERROR:  NO
FLAG:  NO
EIA :  YES   X   X   X   X   X   X   X   1
CTR  1
:  NO
OUTSTANDING FRAME:  NO
```

Figure 38-3

```
** TRIGGER 0 ACTIONS **

TESTA:  NO
TESTB:  NO
LOAD PROG:  NO
CRT:  NO
FLG:  NO
PRMT:  YES   Send Disconnect
ALARM:  NO
TMOUT#1:  YES   RSTRT   3.000
TMOUT#2:  NO
TIMER#  1
:  NO
TIMER#  2
:  NO
CNTR #  1
:  NO
CNTR #  2
:  NO
XMIT:  YES
BCC:  GD
 BEGIN FRAME:  YES
 FR TYPE:  DISC
ADR:  FF
 P/F:  1
 TEXT   :
EIA:  NO
XMT VAR:  NO
RECBUF :  NO
OUTSYNC:  NO
SET CAPTURE MEMORY:  NO
PRINT:  NO
```

Figure 38-4

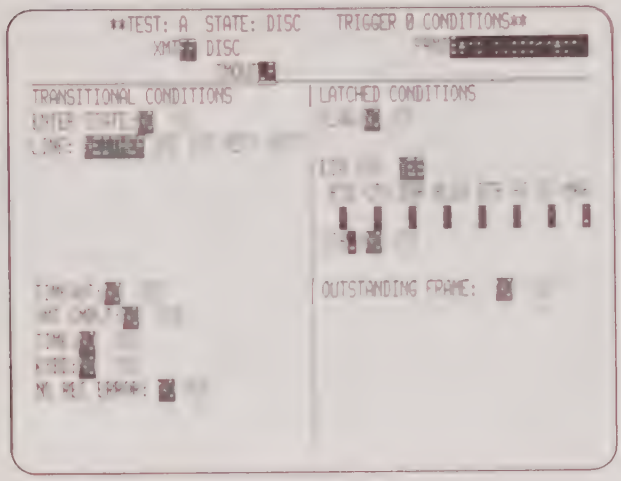


Figure 38-5

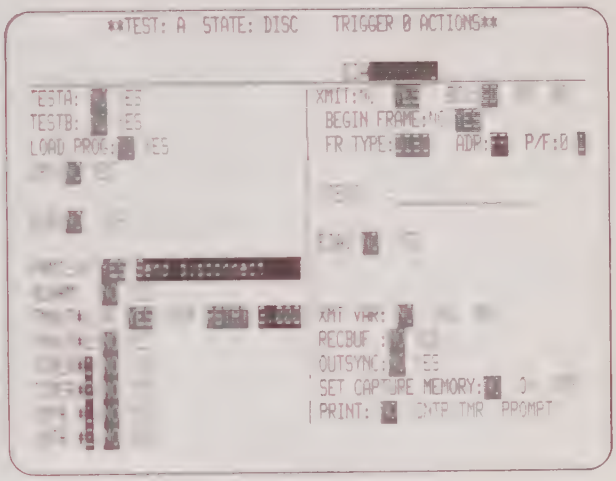


Figure 38-6

```
** MESSAGE 0 **

BEGIN FRAME:  NO    R E A D sp M E sp D O C . T h i s sp
 p r o g r a m sp h a s sp sp   t h r e e sp b a s i
 c sp s t e p s . sp 1 . I s s u e s sp D I   S C sp
 t o sp i n s u r e .sp d e v i c e sp i s sp d i s c
 o m m   e c t e d . sp 2 . I s s u e s sp R R sp t
 o sp r e c e i v e sp   R O L . sp 3 . I s s u e s
sp S N R M sp t o sp v e r i f y sp sp   N S A / U A
sp sp sp R E A D sp M E S S A G E sp 1
```

Figure 38-7

(b) Manual Data Freeze. The status information on Lines 1 and 2 will be printed, but the line number and binary character breakdown shown at the right of these lines will not be printed (compare Figures 38-8 and 38-9).

Data is printed without any enhancements, and only the new data -- up to the cursor position -- is printed. In single-line mode, the printout does not distinguish between TD and RD data. The frozen single-line data display shown in Figure 38-8 looks like Figure 38-9 when it is printed out at 72 characters per line.

When DUAL-line display has been selected on the Parameter 2 menu, all data is printed in dual-line format (compare Figures 38-10 and 38-11). A line of TD data is followed by a line of RD data and then a line feed. Thus, the data line following a blank line is always TD data. Dots replace the L-shaped fill symbols (three dots for each character time).

The COMSTATE II automatically converts all data to ASCII before it is sent to the printer interface. All characters for which there are no ASCII equivalents are sent to the printer as hexadecimal.

Each data character is allotted three spaces on the printout to accommodate control characters and hexadecimal. If you select 72 characters per line, therefore, the printout will show only 16 characters per line and will not correlate directly with the CRT display. If you select 120 characters per line, the printout will correspond line for line with the CRT display.

To print a single screen of the CRT display, press PRINT. To print the contents of the entire CRT buffer, press CTRL-PRINT.

(c) Frozen Frame, Packet, or Protocol Trace Display. With the exception of a few hexadecimal characters, printouts of the X.25 Frame Trace, X.25 Packet Trace, SDLC Trace, and SNA Trace displays correlate character for character with the CRT display. Figure 38-12 is the printout of the display in Figure 38-13.

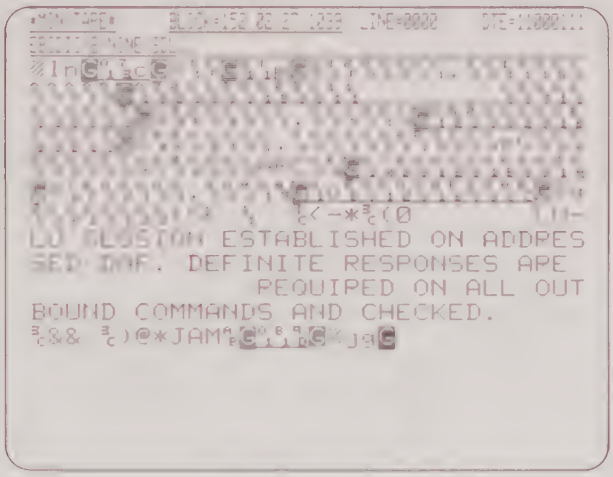

LU SESSION ESTABLISHED ON ADDRES
SED BMF. DEFINITE RESPONSES ARE
REQUIRED ON ALL OUT
BOUND COMMANDS AND CHECKED.

Figure 38-8

```
*MON/TAPE*        BLOCK=152 02/22 0950
EBCDIC/8/NONE/SDLC
 pd l  n :G  01 73 c :G  pd 11 8F:G  01 11 p :G
    pd 10 2F 00 00 00 00 01 ,  80 00 11 01 01 05 00
 00 00 00 01 DD:G  01 30 2D 00 00 00 00 01 EB 80
    00 11 11 sp sp sp sp sp sp sp sp 00 00 07 01 00
 00 00 00 00 00 78:G  pd 32 2F 00 02 00 00 01 ,
    80 00 0D 01 01 CD:G  01 52 2D 00 00 02 00 01 EB
 80 00 0D 01 70:G  pd 54 2F 00 02 01 00 01 ,  80
    00 31 01 03 03 B1 B1 30 80 00 00 e  G  00 00 02
 00 00 00 00 00 18 &  0C 28 02 00 00 03 A  R  C
    00 FD:G  01 74 2D 00 01 02 00 01 EB 80 00 31 0A
:G  pd 76 2F 00 02 01 00 01 ,  80 00 A0 01 69:G
    01 o  2D 00 01 02 00 01 EB 80 00 A0 BC:G  pd q
 2C 00 02 01 00 01 03 80 §  5  F  sp 11 sp sp 3C
    <  -  *  3C (  0  sp sp sp sp sp sp sp L  U  -
 L  U  sp S  E  S  S  I  O  N  sp E  S  T  A  B
    L  I  S  H  E  D  sp O  N  sp A  D  D  R  E  S
 S  E  D  sp D  A  F  .  sp D  E  F  I  N  I  T
    E  sp R  E  S  P  O  N  S  E  S  sp A  R  E  sp
 sp sp sp sp sp sp sp sp sp sp sp sp sp R  E  Q
    U  I  R  E  D  sp O  N  sp A  L  L  sp O  U  T
 B  O  U  N  D  sp C  O  M  M  A  N  D  S  sp A
    N  D  sp C  H  E  C  K  E  D  .  sp sp sp sp sp
 3C &  &  sp 3C )  @  *  J  A  M  AB:G  01 B1 9D
   :G  pd j  g :G
```

Figure 38-9

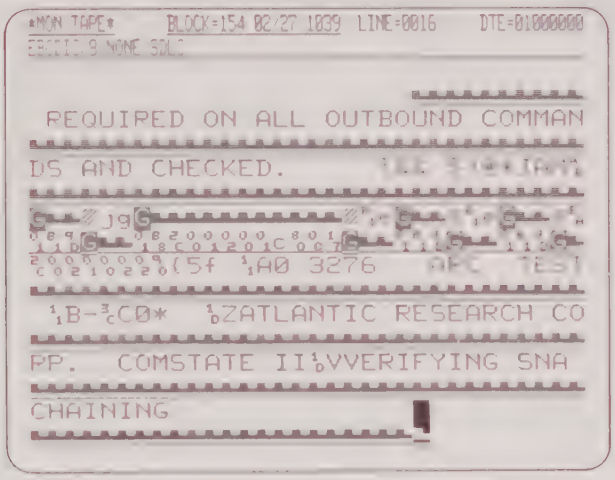

MON TAPE BLOCK=154 02/27 1039 LINE=0016 DTE=01000000
REQUIRED ON ALL OUTBOUND COMMAN
DS AND CHECKED.
ATLANTIC RESEARCH CO
RP. COMSTATE II VERIFYING SNA
CHAINING

Figure 38-10

```
*MON/TAPE*        BLOCK=154 02/27 1042
EBCDIC/8/NONE/SDLC
 I  N  I  T  E  sp R  E  S  P  O  N  S  E  S  sp
.................................................

   A  R  E  sp sp sp sp sp sp sp sp sp sp sp sp sp
   .............................................

 sp R  E  Q  U  I  R  E  D  sp O  N  sp A  L  L
.................................................

   sp O  U  T  B  O  U  N  D  sp C  O  M  M  A  N
   .............................................

 D  S  sp A  N  D  sp C  H  E  C  K  E  D  .  sp
.................................................

   sp sp sp sp 3C &  &  sp 3C )  @  *  J  A  M  AB
   .............................................

:G ...... pd j  g  :G ..........................
 01 B1 9D:G ...... 01 B8 2C 00 01 02 00 01 c  80

   ...... pd B1 e  :G ...... pd B1 e  :G ...... pd BA
    00 17:G ...... 01 B1 9D:G ...... 01 B1 9D:G ...

 2C 00 02 01 00 02 02 90 §  5  f  sp 11 A  0  sp
.................................................

   3  2  7  6  sp sp sp A  R  C  sp sp T  E  S  T
   .............................................

 sp 11 B  -  3C C  0  *  sp sp 1D Z  A  T  L  A
.................................................

   N  T  I  C  sp R  E  S  E  A  R  C  H  sp C  O
   .............................................

 R  P  .  sp sp C  O  M  S  T  A  T  E  sp I  I
.................................................

   1D V  V  E  R  I  F  Y  I  N  G  sp S  N  A  sp
   .............................................

 C  H  A  I  N  I  N  G  sp sp sp sp sp sp sp sp
.................................................

   sp sp sp sp sp sp sp sp sp
   .........................
```

Figure 38-11

```
*MON/TAPE*       BLOCK=014
EBCDIC/8/NONE/SDLC/SNA

DTE:C1 11                                                          G BYTES=2
    ADDRESS=C1   FRAME TYPE=RR NR=0 P/F=1
DCE:C1 11                                                          G BYTES=2
    ADDRESS=C1   FRAME TYPE=RR NR=0 P/F=1
DTE:C1 00   2D 00 00 00 25 9C   6B 80 00
    11 01 01 05 00 00 00 00 03                                     G BYTES=20
    ADDRESS=C1   FRAME TYPE=INFO NR=0 NS=0 P/F=0
    TRANSMISSION HEADER (TH)
      FID TYPE=2 SEGMENT=ONLY EFI=1 DAF=00   OAF=00   SNF=25 9C
    REQUEST HEADER (RH)
      RU CATEGORY=SC FI=1 SDI=0 CHAIN=ONLY DR1I=1 DR2I=0 ERI=0 QRI=0
      PI=0 BBI=0 EBI=0 CDI=0 CSI=0 EDI=0 PDI=0
    REQUEST UNIT (RU)
      TYPE=ACTPU
DTE:C1 11                                                          G BYTES=2
    ADDRESS=C1   FRAME TYPE=RR NR=0 P/F=1
DCE:C1 30   2D 00 00 00 25 9C   EB 80 00
    11 11 40 40 40 40 40 40 40 40
    ¶00 00 07 01 00 00 00 00 00 00                                 G BYTES=31
    ADDRESS=C1   FRAME TYPE=INFO NR=1 NS=0 P/F=1
    TRANSMISSION HEADER (TH)
      FID TYPE=2 SEGMENT=ONLY EFI=1 DAF=00   OAF=00   SNF=25 9C
    RESPONSE HEADER (RH)
      RU CATEGORY=SC FI=1 SDI=0 CHAIN=ONLY DR1I=1 DR2I=0 RTI=0 QRI=0
      PI=0
    RESPONSE UNIT (RU)
      TYPE=ACTPU
```

Figure 38-12

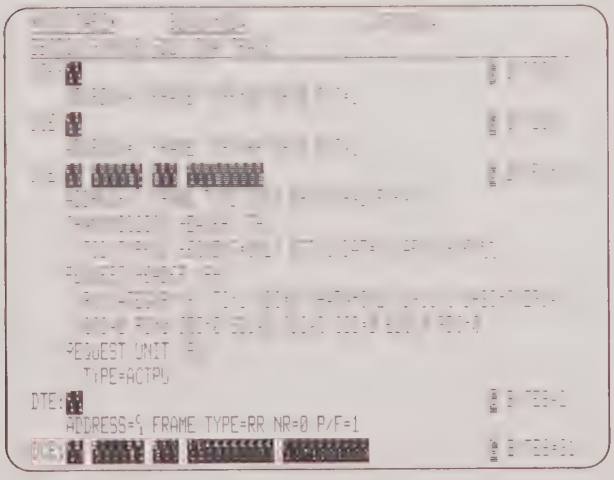


Figure 38-13

```
*EM DCE/LINE*    BLOCK=094 03/30 1321
EBCDIC/8/NONE/ASYNC

              TEST A                                  TEST B

 * START :                                 START :
 *           Start Test "A"
 *           Press"M"for message                      Start "B" Test
                                           *          Press "S" to stop A
             Fox Message Sent              *          Press "G" - start A
   START :                                 *          Test "A" restarted
             Start Test "A"                * NEXT   :
 *           Press"M"for message                      Press "T"to trace
```

Figure 38-14

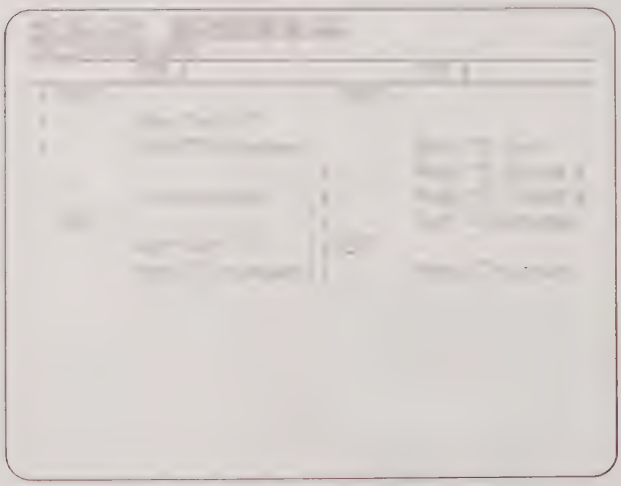


Figure 38-15

(d) Capture Memory Playback. Data can be played back directly to the printer when tape, RAM, or CRT data is selected as source. The printout will use three character spaces for each data character. The relationship of the printed page to the CRT display will depend on the CHARS/LINE selection on the Parameter 2 menu (32 or 64) and the CHAR/LINE (72 or 120) selection on the Parameter 3 menu:

With 32 CHARS/LINE (Parameter 2) and 120 CHAR/LINE (Parameter 3), a line of printout will correlate with a line of CRT display;

With 64 CHARS/LINE (Parameter 2) and 120 CHAR/LINE (Parameter 3), 2 lines of printout will correlate with one line of CRT display;

With 32 CHARS/LINE (Parameter 2) and 72 CHAR/LINE (Parameter 3), 2 lines of printout will correlate with one line of CRT display;

With 64 CHARS/LINE (Parameter 2) and 72 CHAR/LINE (Parameter 3), 4 lines of printout will correlate with one line of CRT display.

Each printed line which is the beginning of a line of CRT display will be flush with the left side of the page; continuations will be indented.

Taped data may be played back to both CRT and printer simultaneously. If SINGLE or DUAL line has been selected on the Parameter 2 menu, the data will be printed in the same manner as for static data display (see Section 38.4b). The two status lines will be repeated at the top of the form; that is, after every 40 printed lines of data (per 66-line page).

(e) Protocol Trace Format. If X.25 FRAME, X.25 PACKET, SDLC TRACE, or SNA TRACE is selected, both the status lines and the column headings seen at the top of the CRT display will be repeated on the printout at the top of the form; that is, after every 58 printed lines of protocol (per 66-line page).

(f) Prompt/State or Prompt Trace. Figure 38-14 is the printout of the display in Figure 38-15. Printouts of the Prompt/State or Prompt Trace correlate character for character with the CRT display.

```
** TAPE DIRECTORY **

TAPE NAME: TEST LIBRARY VOLUME ONE

001: ASYNC  TEST  ONE            (1)4600  V11.99A
002: X25 MONITOR                 (1)4600  V11.99A
003: SDLC EM DTE TEST 1          (1)CS-II V10.01B
004:   SDLC-SNA INTERACTIVE      (7)CS-II V10.01B
005: BISYNC MONITOR TEST 2       (1)3600  V40.99A
007: HDLC LINK TEST              (1)3600  V40.99A
009: ASCII 1200 BPS TERMINAL     (1)CS-I  V12.01C
011: X.21 TEST DCE CALLING       (1)CS-I  V12.01C
013: 4600 ASYNC TEST TWO         (1)4600  V11.99A
015: BSC/X25 INTERACTIVE TEST    (1)4600  V11.99A
017: SYNC INTERACTIVE  A         (1)4600  V11.99A
018:   X.25 INTERACTIVE I       (4)CS-II V01.12C
019: SYNC INTERACTIVE  B         (1)4600  V11.99A
021: SYNC INTERACTIVE  C         (1)4600  V11.99A
023:   X.25 INTERACTIVE II      (8)CS-II V01.12C
027:   X.25 INTERACTIVE III     (7)CS-II V01.12C
039: SDLC FRAME TEST             (1)4600  V11.99A
```

Figure 38-16

(g) Program Tape Directory. You can print the entire Program Tape Directory by pressing the PRINT key while the Program Directory menu is displayed. Figure 38-16 is the printout for the display in Figure 38-17.

38.5 TRIGGER PRINT ACTIONS

The PRINT field on the trigger actions menu allows you to print CNTR/TMR statistics or the PROMPT displayed by the trigger on which it is selected.

Any trigger condition may be used to initiate the PRINT action. The counters and timers you wish to print must also be selected on the Parameter 6 (Statistics) menu (see Figure 38-18).

Lines 1 and 2 of the CRT display will be printed on the top of each page followed by the prompt(s) or counter(s) and timer(s) you have selected. The status lines will be repeated at the top of each 66-line page. Line 3 has labels for DATE and TIME; the first eight characters of named counters or timers will also be listed. The values (or prompts) will be printed beginning on Line 4 next to the date and time of the printout. Figure 38-19 displays the current values of the counters shown in Figure 38-18 and a prompt. Figure 38-20 shows the CRT display at the time the prompt was printed.

This trigger action is particularly useful for printing error or statistical logs.

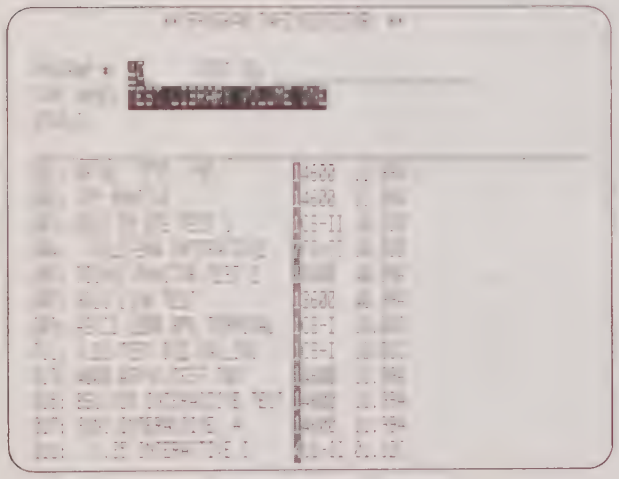


Figure 38-17

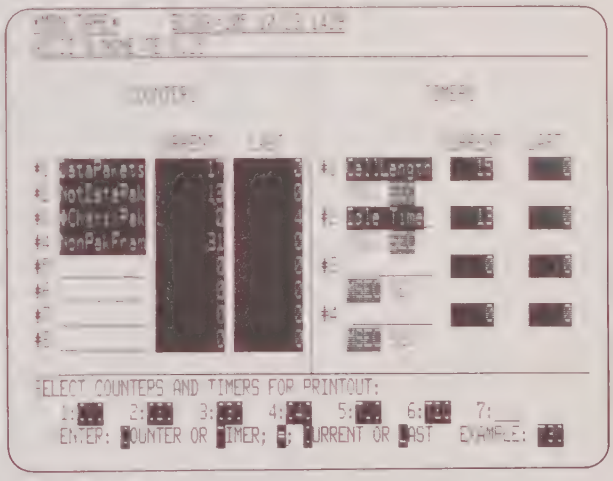


Figure 38-18

```
*MON/TAPE*        BLOCK=105  10/23  1439
ASCII/8/NONE/7E/X.25
             X25 CALL STATISTICS
10/23  1439          13         8         41         18          8          8
10/23  1439          17        13          0         31         15         13
10/23  1440          27        20         46         45         30         19
10/23  1501          34        25          0         58         40         24
10/23  1501          45        38         74         78         55         32
10/23  1501          57        47        155        100         68         41
10/23  1502          74        49        239        110         88         44
10/23  1502 END OF X.25 STATS
```

Figure 38-19

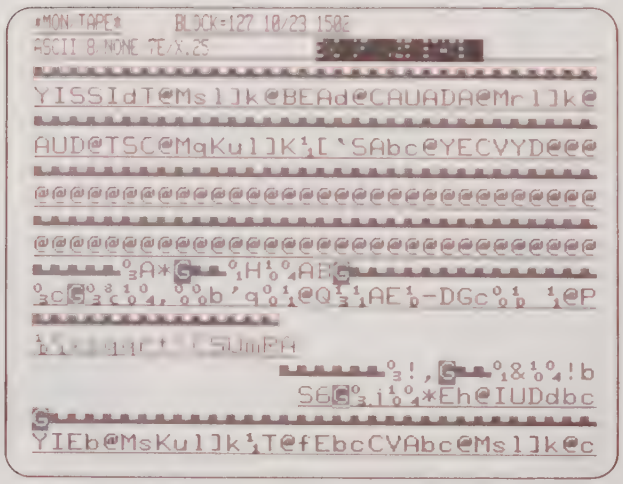


Figure 38-20

39 EMULATE MODES: INTERACTIVE TESTING

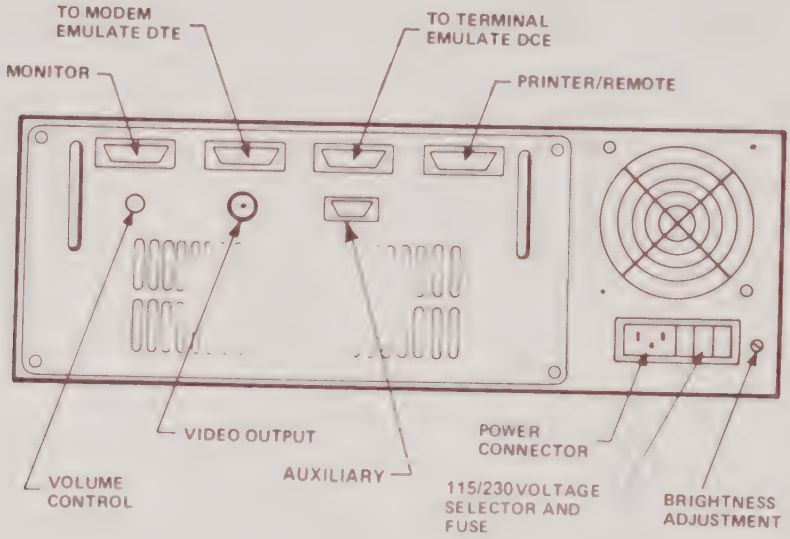

TO MODEM
EMULATE DTE
TO TERMINAL
EMULATE DCE
MONITOR
PRINTER/REMOTE
VIDEO OUTPUT
POWER
CONNECTOR
AUXILIARY
VOLUME
CONTROL
115/230 VOLTAGE
SELECTOR AND
FUSE
BRIGHTNESS
ADJUSTMENT

Figure 39-1

39
THE EMULATE MODES: INTERACTIVE TESTING

39.1 COMSTATE II EMULATE MODES AND TRANSMITTERS

Logically, interactive testing is selected in the MODE field of the Parameter 1 menu as either EMulate DTE or EMulate DCE. Physically, the COMSTATE II transmission facilities must be switched between RD and TD by moving the data line between the EM DCE (TO TERMINAL) connector and the EM DTE (TO MODEM) connector on the rear panel (see Figure 39-1).

When you select EMulate DCE on the Parameter 1 menu, the COMSTATE II transmits on Pin 3 (RD) of the EM DCE connector and expects to receive line data on Pin 2 of that connector. It expects to receive its own transmissions at its RD receivers, and expects any other data -- whether from the line or from its own Capture Memory -- to arrive at its TD receivers. If you choose EMulate DTE on the Parameter 1 menu, COMSTATE II transmits on Pin 2 of its EM DTE connector and expects to receive line data on Pin 3 of that connector. It expects to receive its own transmissions at its TD receivers, and expects any other data to come in at its RD receivers.

It is essential to correctly match the logical interactive mode with the data connection at the rear of the unit.

NOTE: When TAPE is selected for data SOURCE and EM DTE or EM DCE for MODE on the Parameter 1 menu, data from the tape will be played back on both Emulate connectors: DTE data on the EM DTE connector and DCE data on the EM DCE connector. Only taped data from the side of the line opposite that selected for MODE will be displayed, however.

NOTE: Character-oriented TAPE/CRT data cannot be played back in an emulate mode.

Connecting the data line to the MONITOR port disconnects the transmitter and prevents interference with the monitored line. This connector should be used when you select MONitor mode on the Parameter 1 menu.

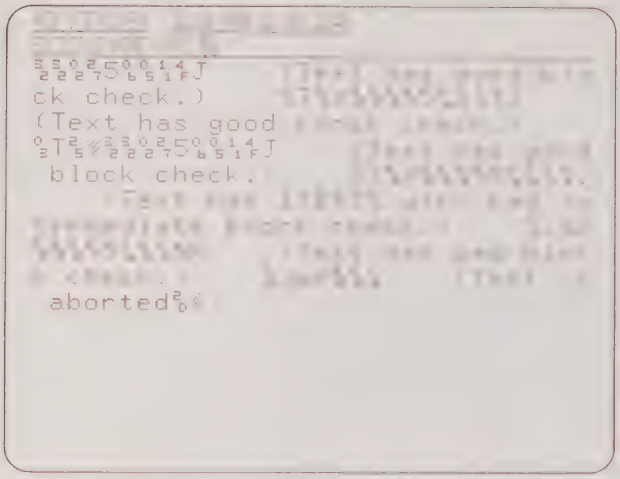


Figure 39-2

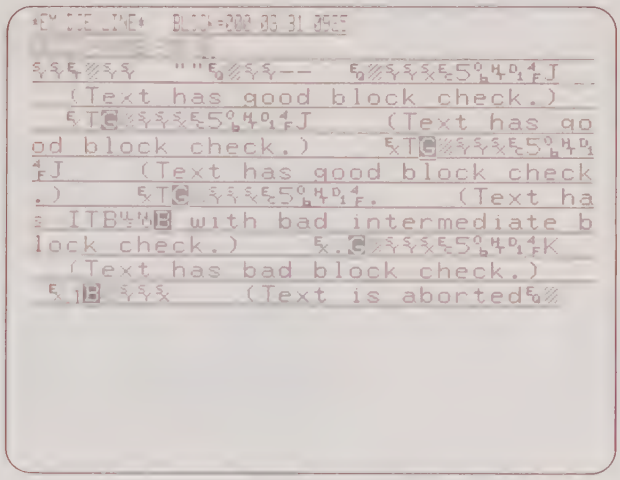


Figure 39-3

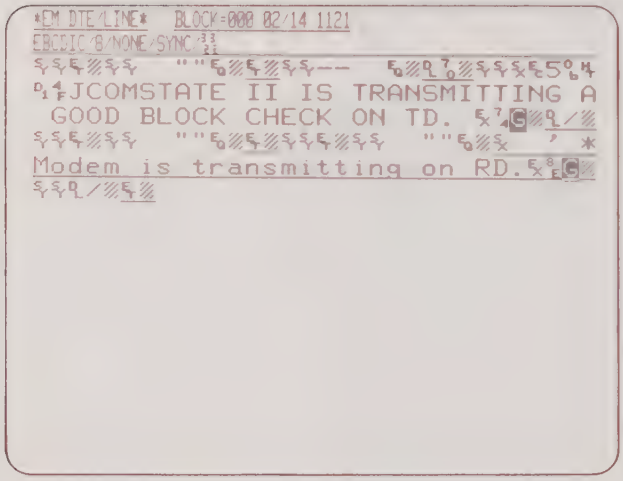


Figure 39-4

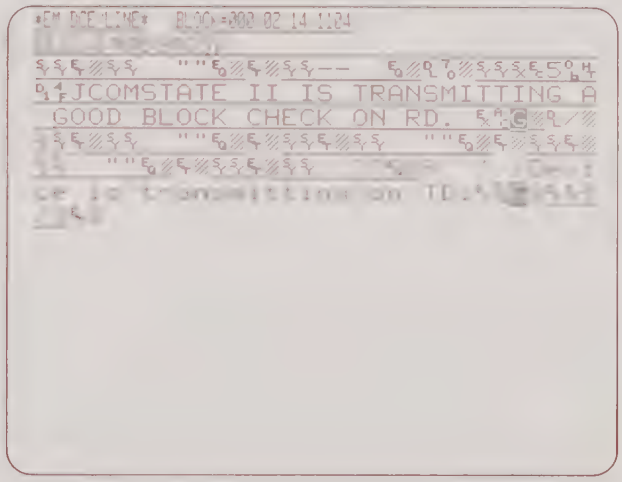


Figure 39-5

39.2 DISPLAY

To interpret the COMSTATE II interactive mode display, first check the status information on line 1 (see Figures 39-2 and 39-3). Notice that in Emulate DTE Mode (Figure 39-2), data transmitted by COMSTATE II is always displayed as DTE data with no underline; for Emulate DCE (Figure 39-3), data transmitted by COMSTATE II is underlined as for received DCE data. In the interactive modes, what you see on the screen as transmitted data is always what is actually transmitted on line by COMSTATE II. The block check characters you see in Figure 39-2 are those actually transmitted (Received Block Check is off in this example), and in Figure 39-3 you see the second block check character replaced by G after COMSTATE II does a received block check on its own transmitted data and compares it with its transmitted BCC.

In Figures 39-4 and 39-5, you see both transmitted and received data. Always check Line 1 of the display to be sure which data is being transmitted. In Figure 39-4 the COMSTATE II is transmitting on TD so transmitted data is not underlined. In Figure 39-5, it is transmitting on RD so the transmitted data is underlined.

The COMSTATE II transmitter is controlled by triggers. Each of the 128 triggers can transmit a message of up to 16 characters. This message can include references to any of 16 message buffers that you can preenter using the Message-Entry menus (see Section 42.1) for up to 1024 more bytes of message content. You can also include a standard stored message or the output of the "transmit variable" counter, echo received data, and type in messages from the keyboard in Run Mode. You can set the triggers to send messages in any sequence (see Section 39), or you can obtain manual control of triggers through the keyboard (Sections 19.12 and 19.16).

TABLE 40-1
INTERFACE LEADS CONTROLLED BY COMSTATE II

RS-232/V.24				Em DTE Mode	Em DCE Mode	Monitor Mode
Pin	Name	EIA	CCITT			
2	TD	BA	103	Driven by COMSTATE II	GND via 3 kohms	Input to 30-kohm receiver
3	RD	BB	104	GND via 3 kohms	Driven by COMSTATE II	Input to 30-kohm receiver
20	DTR	CD	108/2	Driven by COMSTATE II	GND via 4.7 kohms	Input to 30-kohm receiver
4	RTS	CA	105	Driven by COMSTATE II	GND via 4.7 kohms	Input to 30-kohm receiver
8	RLSD	CF	109	GND via 4.7 kohms	Driven by COMSTATE II	Input to 30-kohm receiver
5	CTS	CB	106	GND via 4.7 kohms	Driven by COMSTATE II	Input to 30-kohm receiver
22	RI	CE	125	GND via 4.7 kohms	Driven by COMSTATE II	Input to 30-kohm receiver
15	SCT	DB	114	GND via 3 kohms	Driven by COMSTATE II	Input to 30-kohm receiver
17	SCR	DD	115	GND via 3 kohms	Driven by COMSTATE II	Input to 30-kohm receiver
24	SCTE	DA	113	Driven by COMSTATE II	GND via 3 kohms	Input to 30-kohm receiver
6	DSR	CC	107	GND via 4.7 kohms	Driven by COMSTATE II	Input to 30-kohm receiver

40
INTERFACE LEAD CONTROL

When a data line is connected to one of the Emulate ports on the rear panel, the COMSTATE II assumes control of the RS-232/V.24 interface. There is no need to program the lead activity for each transmission: On the Parameter 4 menu you select, in advance, the sequence of lead activity and the delays you want, and this "envelope" is automatically used each time a message is sent.

> NOTE: You can program triggers to override your Parameter 4 configuration (see Section 40.7).

Section 40.1 explains COMSTATE II interface lead control in electrical terms. Sections 40.2 through 40.6 describe the Parameter 4 menu selections that you use to set up various interface control configurations.

40.1 LEADS DRIVEN BY THE COMSTATE II

In order to use either of the interactive modes, you must break the line and connect it to one of the two Emulate connectors on the rear of the unit. In Emulate DCE mode, if you have used the correct connector, the COMSTATE II will control leads usually controlled by the modem; in Emulate DTE mode, it will control leads usually controlled by the data terminal equipment.

When you power up the COMSTATE II unit and plug your equipment into one of its two Emulate connectors, it will immediately, without waiting for Run Mode, apply an OFF voltage as defined by the RS-232/V.24 standard to each of the leads that it controls. These leads are specified in Table 40-1.

> NOTE: The terms ON and OFF imply that an RS-232/V.24 lead is driven to either ON or OFF voltage in accordance with the RS-232/V.24 standard. The standard defines a signal as OFF when it is more negative than -3 volts with respect to signal ground. A signal is defined as ON when it is more positive than +3 volts with respect to signal ground. Thus, OFF always implies that the lead is driven to the OFF state and we use the term inactive to mean that a lead is not being driven ON or OFF.

If you make any changes in either the LINE USE or STATIC LEADS field of the Parameter 4 menu, your changes will become effective when the unit enters Run Mode.

TABLE 40-2
PARAMETER 4 MENU SELECTIONS

Mode	Static Leads	Leads Controlled by COMSTATE II	Leads Monitored by COMSTATE II	Selectable Delays
FDX				
EM DTE (Figure 40-1)	DTR, RTS	(None)	(None)	(None)
EM DCE (Figure 40-2)	RI, DSR, RLSD, CTS	CTS	RTS, TD	T2, T5
SWITCHED				
EM DTE (Figure 40-3)	DTR	RTS, TD	CTS	T1, T3, T4
EM DCE (Figure 40-4)	RI, DSR	CTS, RLSD, RD	RTS, TD	T2, T5, T6, T7
EM DROP				
EM DTE (Figure 40-6)	DTR	RTS,TD	CTS	T1, T3, T4
EM DCE (Figure 40-7)	RI, DSR	CTS, RLSD, RD	RTS, TD	T2, T5, T6, T7
EM HOST				
EM DTE (Figure 40-8)	DTR, RTS	(None)	(None)	(None)
EM DCE (Figure 40-9)	RI, DSR, RLSD, CTS	CTS	RTS, TD	T2, T5

40.2 LINE USE

LINE USE is the first field on the Interface Control menu (Parameter 4; Figure 40-1). In conjunction with the Mode selection on the Parameter 1 menu, the Line Use selection determines what selections will appear on the remainder of the Parameter 4 menu. Table 40-2 summarizes these relationships for your reference as you follow this discussion.

40.2.1 Full-Duplex Operation

The default selection is FDX, for full-duplex or continuous carrier use. Figures 40-1 and 40-2 show the default Parameter 4 menu for Emulate DTE and Emulate DCE modes, respectively. In FDX mode, the active static leads are set to the states assigned them in the Static Leads field. When a trigger transmit action comes true, data will be transmitted immediately, regardless of the status of any of the interface leads.

40.2.2 Half-Duplex Use

For half-duplex use, select SWITCHED. Figures 40-3 and 40-4 show the menus for this selection.

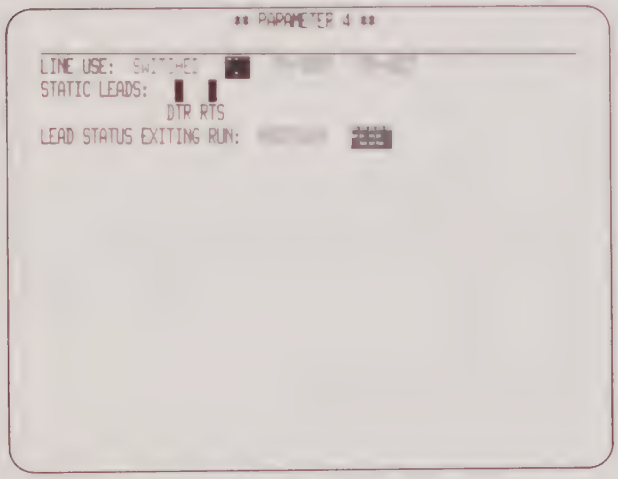


Figure 40-1 EM DTE, FDX Mode (default).

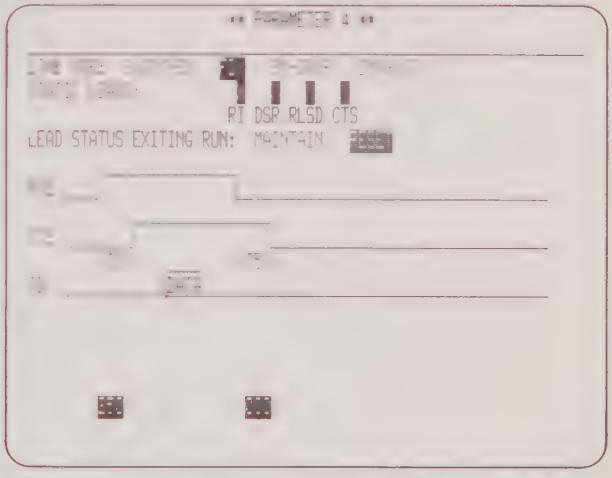


Figure 40-2 EM DCE, FDX Mode (default).

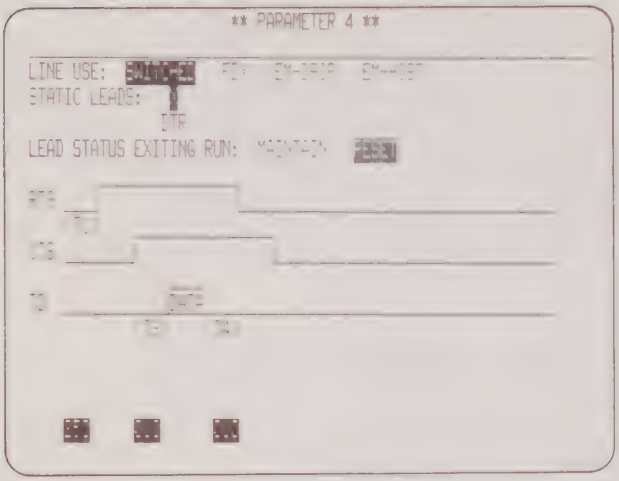


Figure 40-3 EM DTE, SWITCHED Mode.

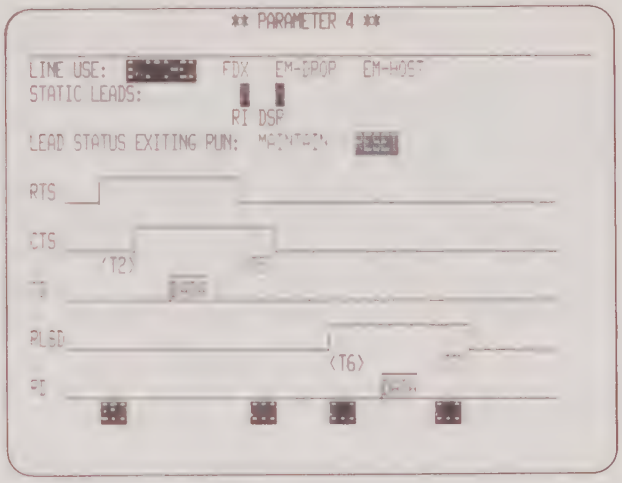


Figure 40-4 EM DCE, SWITCHED Mode.

40.2.3 Multidrop Operation

There are two menu selections specifically for multidrop testing, EMulate DROP and EMulate HOST. Figure 40-5 shows the configurations in which a COMSTATE II unit can be connected in a multidrop network.

(a) Emulate Drop. When it is emulating a DTE, the COMSTATE II behaves as though it were in a Switched network (Figure 40-6). It turns RTS on, and waits for CTS before transmitting data. The delay between CTS coming high and data transmission is selectable.

When the COMSTATE II is emulating a DCE, it switches CTS and RLSD (Figure 40-7). You may select the RTS-CTS delays, and the delay between RLSD high and data transmission.

(b) Emulate Host. When it is emulating a DTE, the COMSTATE II transmits as though in a full-duplex network (Figure 40-8). RTS is a static lead (normally high).

When it is emulating a DCE, it switches CTS, and the RTS-CTS delays can be selected on the menu (Figure 40-9).

40.3 STATIC LEADS

In this field, you will be presented with several RS-232/V.24 lead choices depending on your prior selections (see Table 40-2). The static leads are not dynamically controlled in Run Mode: they are set to the prescribed state at entrance to Run Mode and will be maintained in that state.

When the entry in a STATIC LEADS data-entry box is X (Don't Care), the lead will be maintained at the OFF voltage. A 0 (zero) in the data-entry box also means OFF voltage level. In FDX mode, there is one case in which the distinction between DC and 0 is significant (see Section 40.6.1).

Enter a 1 (one) in the box for any lead that you want to turn ON.

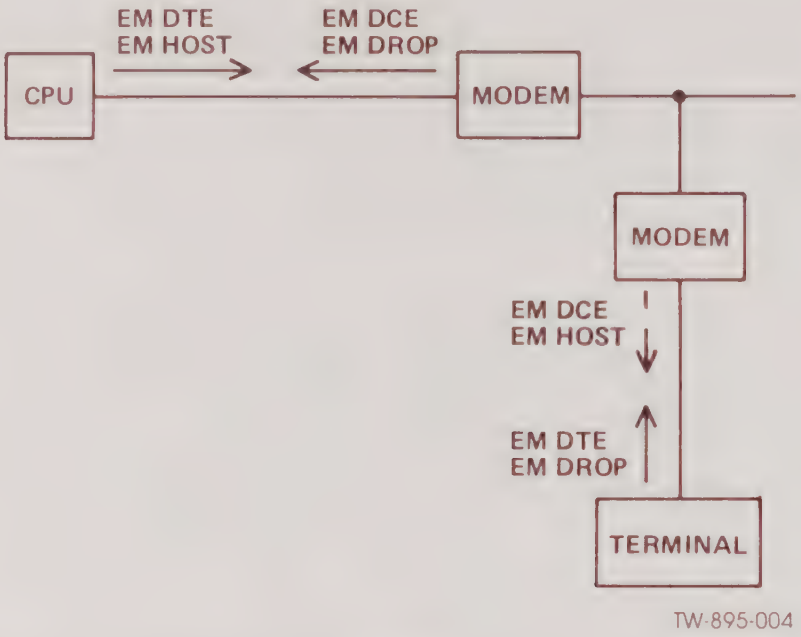


Figure 40-5 Connecting the COMSTATE II in a multidrop system.

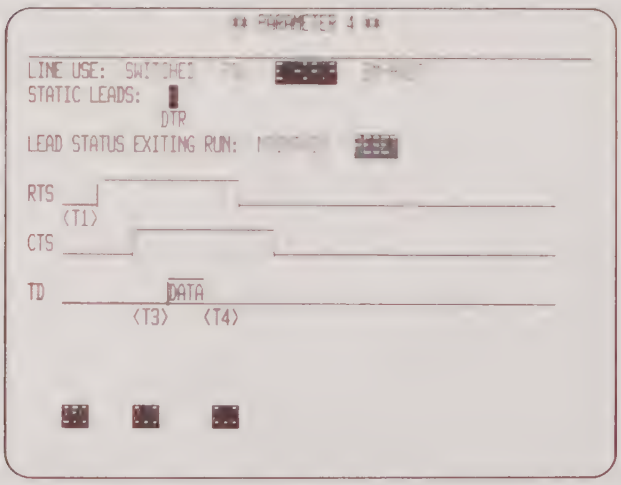


Figure 40-6 EM DROP, Em DTE Mode.

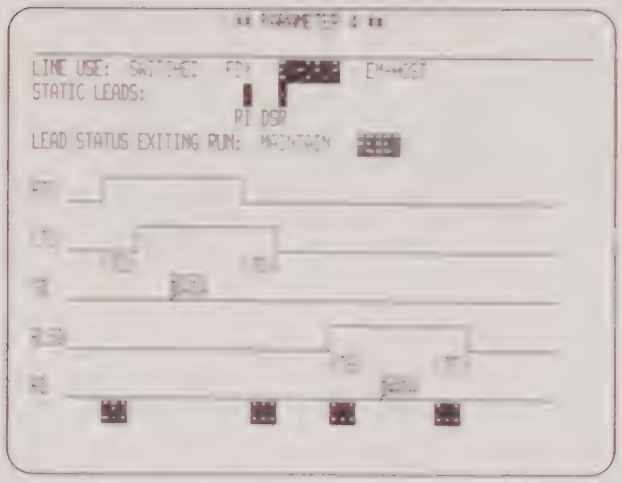


Figure 40-7 EM DROP, Em DCE Mode.

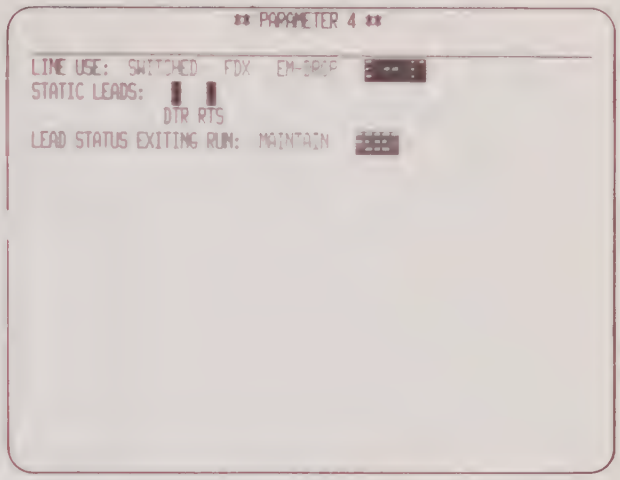


Figure 40-8 EM HOST, Em DTE Mode.

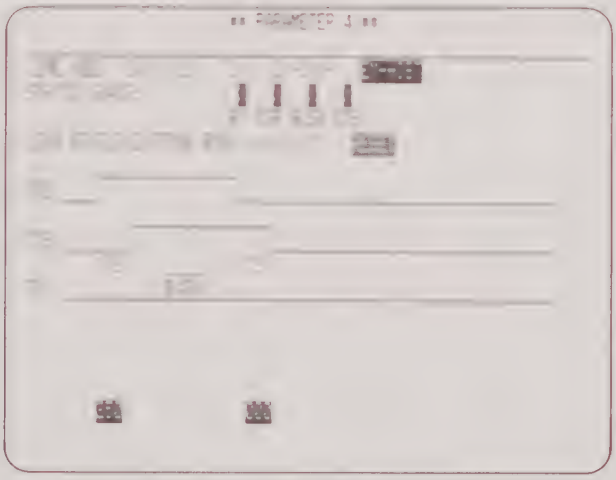


Figure 40-9 EM HOST, Em DCE Mode.

TABLE 40-3
DELAY TIME SELECTIONS

Field	Definition	Default Value (msec)
T1	Time from trigger true to RTS ON	250
T2	RTS ON to CTS ON	250
T3	CTS ON to Start Xmit	010
T4	End Xmit to RTS OFF	010
T5	RTS OFF to CTS OFF	000
T6	RLSD ON to Start Xmit	010
T7	End Xmit to RLSD OFF	010

40.4 LEAD STATUS EXITING RUN

(a) Reset. If you select RESET, then each time the COMSTATE unit leaves Run Mode, all active interface leads will be reset to the OFF voltage state and remain that way until the unit enters Run Mode again. The Test programs will also be reset.

(b) Maintain. MAINTAIN allows you to preserve data communications parameters even after exit from Run Mode. Selecting MAINTAIN has five specific effects:

- The active static leads of the RS-232/V.24 interface controlled by the COMSTATE II maintain their voltage levels, even in Program Mode.
- The status of the sixteen internal trigger flags is stored. This allows you to interrupt tests in which flags are used by pressing the PROGRAM key, make changes in the tests, and then resume the tests from wherever they were interrupted.
- The current values of N(S) and N(R) are stored. When the unit reenters Run Mode, transmission continues from the last values of N(S) and N(R) (see Section 49.6).
- The current values of P(S) and P(R) for six LCNs are stored (see Sections 49.8 and 49.10). When the unit reenters Run Mode, transmission continues from the last values of P(S) and P(R).
- The value of the four Transmit Variables (see Section 42.6) is stored. When transmission resumes in Run Mode, the Transmit Variables will be incremented from the last value sent.

40.5 DELAY TIME SELECTION

The graphic shown in the figures is displayed for all interface control modes except EM DTE, FDX. Under each delay time choice allowed by your prior selections (see Table 40-2), there will be a three-digit data-entry field.

The seven delay time fields, T1 through T7, are defined in Table 40-3. The maximum time that you may enter in a delay time entry field is 999 milliseconds. When you position the cursor on a delay time field, the appropriate definition is displayed at the bottom of the screen.

40.6 OPERATION IN THE VARIOUS INTERFACE CONTROL MODES

40.6.1 Full Duplex

(a) CTS Control. FDX, EM DCE is the one case in which there is a distinction between Don't Care (X) and OFF (0) in the Static Leads field. If the entry for CTS in the Static Leads field is Don't Care, then when the terminal turns RTS on the COMSTATE II will respond with CTS after delay T2; when RTS is turned off, COMSTATE II will wait time T5 and turn off CTS. If you want CTS to remain OFF, enter a 0 in the CTS data-entry box; if you want CTS to be continuously ON, enter a 1. Thus if a 0 or 1 is entered in the Static Leads field for CTS, it will not follow RTS.

(b) 7E Framing. For 7E/X.25 and the two SDLC formats, in FDX mode one of the data leads idles with flags in Program Mode: For EM DTE, TD idles with 7E (hex) flags; for EM DCE, RD idles with flags.

Figure 40-10 Trigger Actions menu with EIA:YES selected.

40.6.2 Switched

(a) Emulate DTE. When a trigger comes true to transmit, the COMSTATE II will wait until RLSD is OFF and then start timeout T1. If RLSD is off when the trigger comes true then timeout T1 is started immediately. After T1 milliseconds the COMSTATE II will turn on RTS; it will then wait for CTS. When CTS goes on timeout T3 will start. After T3 milliseconds the COMSTATE II will begin to transmit the message. After the last character has been transmitted timeout T4 will start. After T4 milliseconds the COMSTATE II will turn off RTS and then wait for CTS to go off. At this point the COMSTATE II considers the transmission complete.

(b) Emulate DCE. When a trigger comes true to transmit, the COMSTATE II will wait until CTS is off; then turn on RLSD. If CTS is already off, RLSD will be turned on immediately, and timeout T6 will then begin. After T6 milliseconds, the COMSTATE II will begin to transmit the message. After the last character of the message has been transmitted, timeout T7 will start. After T7 milliseconds the COMSTATE II will turn off RLSD. At this point the COMSTATE II considers transmission complete.

The COMSTATE II also monitors RTS. When RTS goes on, timeout T2 starts. After T2 milliseconds the COMSTATE II turns CTS on; it then waits for RTS to go off. When RTS goes off, timeout T5 starts. After T5 milliseconds the COMSTATE II will turn off CTS.

40.7 TRIGGER CONTROL OF INTERFACE LEADS

The six control leads that are controlled by the Parameter 4 menu -- RTS, CTS, DSR, RLSD, DTR, RI -- may also be controlled by triggers. On a Trigger Actions menu, select EIA: YES (see Figure 40-10). To have the trigger turn a lead off, enter 0; to turn the lead on, enter a 1. X means Don't Care.

If you select a lead that is not under COMSTATE II control in the current Emulate Mode, the instruction will be ignored.

In using this action, remember that there is no coordination between the Parameter 4 logic and the trigger logic. If the test program and the Parameter 4 configuration are not carefully planned, interface lead control may not be well enough defined to give meaningful test results.

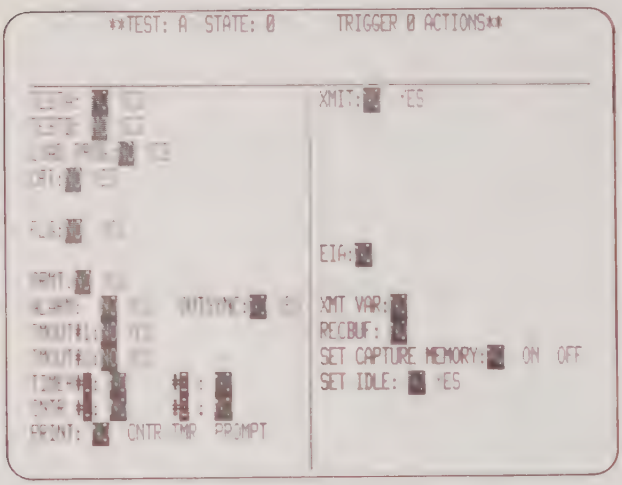


Figure 41-1 Default trigger Actions menu with Emulate Mode selected. Selections for interactive operation are all grouped on the right-hand side of the menu.

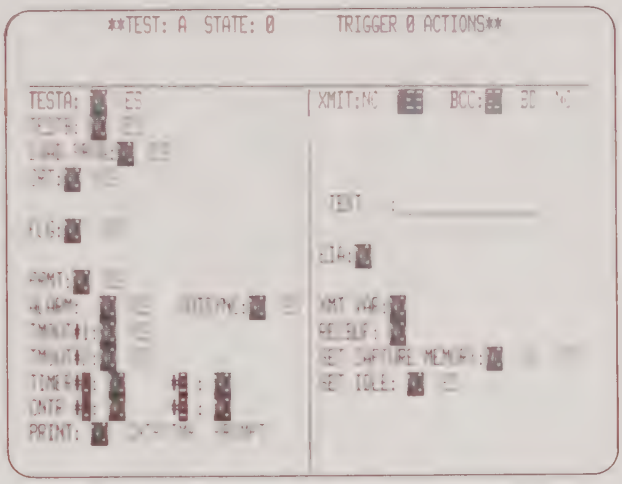


Figure 41-2 Default trigger Actions menu for Emulate Mode with XMIT: YES selected.

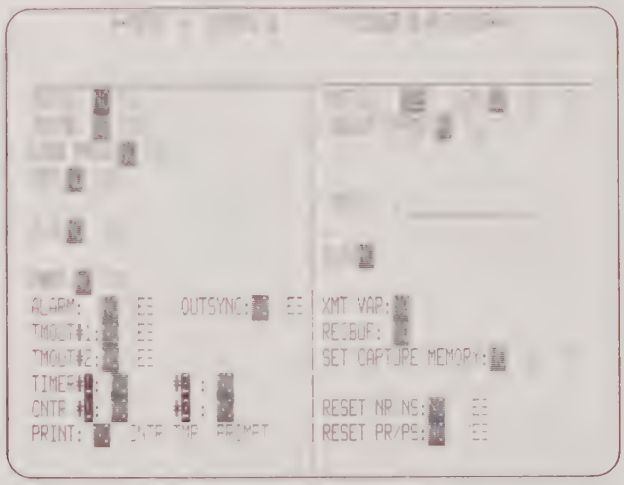


Figure 41-3 Trigger Actions menu for Emulate Mode showing XMIT BCC options with 7E/X.25 selected.

41
SENDING THE MESSAGE: TRIGGER TRANSMIT ACTION

COMSTATE II transmissions are always under trigger control. The XMIT line of the Trigger Actions menu must be used to initiate all transmissions. However, you may control trigger operation manually by selecting keyboard actions as trigger conditions (see Sections 20.12 and 20.16).

XMIT is the first field on the right-hand side of the trigger Actions menu when an Emulate Mode has been selected (MODE field of the Parameter 1 menu). A number of other actions designed specifically for interactive operation are presented directly below this one. These selections are explained in Sections 42.4, 42.6, 42.7, 42.8, 43.2, and 43.3. Figure 41-1 shows the default Trigger Actions menu for the Emulate Modes.

When XMIT:YES is selected, two more fields are always added to the display: BCC and TEXT. For the X.25 and SDLC formats, there is also a BEGIN FRAME field (compare Figure 41-2 with Figure 41-1).

41.1 TRANSMITTING BLOCK CHECKS

The BCC field allows you to send either a GooD or a BaD BCC. The default selection is GD.

For correct operation there should be only one end-of-block sequence in the Xmit Text field and it must be at the end of the entry. COMSTATE II will make the proper calculation for your Parameter 1 menu selections and send either a good or bad BCC.

If you select NO, then no block check character will be sent.

If received Block Check is ON in the unit (Parameter 1 menu; see Section 16.1), the second block check character transmitted will be replaced by G or B on the display; if received Block Check is not on, you will see both block check characters as they are actually transmitted.

For 7E/X.25, SDLC, or SDLC/NRZI, the bad BCC will be CRC-16 instead of CCITT; for other formats it will be an inverted good BCC.

For 7E/X.25, SDLC, and SDLC/NRZI, the NO selection is replaced by AB (see Figure 41-3). You may send an abort by selecting AB whether or not you have designated any messages to be sent. If you have designated any messages to be sent, the transmission will be aborted.

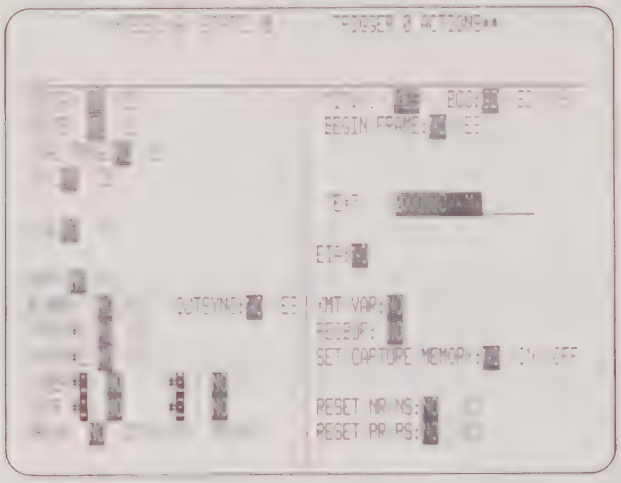

TRIGGER 0 ACTIONS**
BEGIN FRAME:
EIA:
AMT VAR:
SET CAPTURE MEMORY:
RESET NR/NS:
RESET PR/PS:

Figure 41-4

41.2 BEGIN FRAME

For the X.25 and SDLC formats, BEGIN FRAME:YES allows automatic entry of frame- and packet-level protocol using mnemonic selections. These fields are explained in detail in Section 49.

41.3 TEXT FIELD

The TEXT field is a 16-character data-entry field in which you can enter an entire message or any of a number of symbols that call messages from special buffers.

All ASCII keyboard alphanumeric, control, and hexadecimal characters are legal in this field; the Flag and other special keys are not. The special buffer symbols are as follows:

ALT-0,..., ALT-F	Message-Entry menus 0 through F
ALT-X, ALT-Y	Receive Buffers X and Y
ALT-K	Keyboard Buffer
ALT-M	Factory-Stored Fox Message
ALT-T, ALT-U, ALT-V, ALT-W	Transmit Variables

NOTE: Hit the ALT key, then the character key in succession. SHIFT or CAPS LOCK must be On for these entries. Using ALT with lowercase letters changes the meaning.

These special characters are shown in the Text field in low-intensity reverse image to distinguish them from alphanumeric data characters (see Figure 41-4). The special messages represented by these characters are discussed in Section 42.

41.4 MESSAGE TRANSMISSION PRIORITIES

There is one 8-character buffer for all trigger Transmit actions. When a Transmit action comes true, the action (one character) is put into this buffer. The transmissions are then initiated in the order in which the actions entered the buffer. Thus, if triggers come true in the order 1, 5, and 2, the blocks will be sent in that order. If more than eight Transmit actions are stacked, an error message (XMIT BUFFER OVERFLOW) will be displayed. Once the error message is displayed, the PROGRAM key must be pressed to reset the error.

41.5 MESSAGE BLOCKING

Message blocks transmitted by separate triggers will be transmitted separately with at least one full character (or 7E flag) between blocks. In Switched, Em Drop, or Em Host Mode (Section 40), the interface leads will be controlled between blocks.

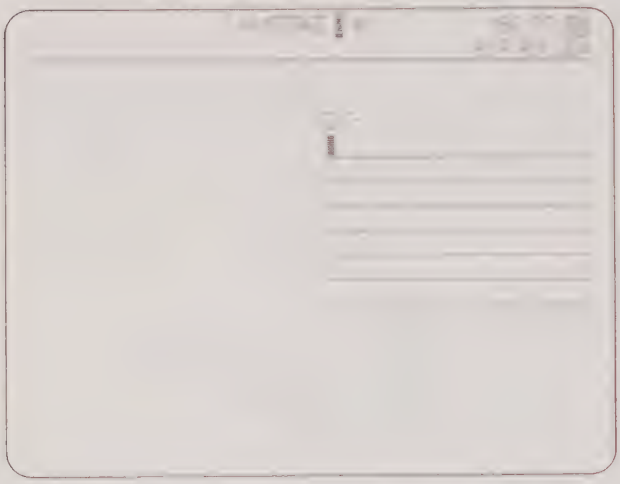


Figure 42-1

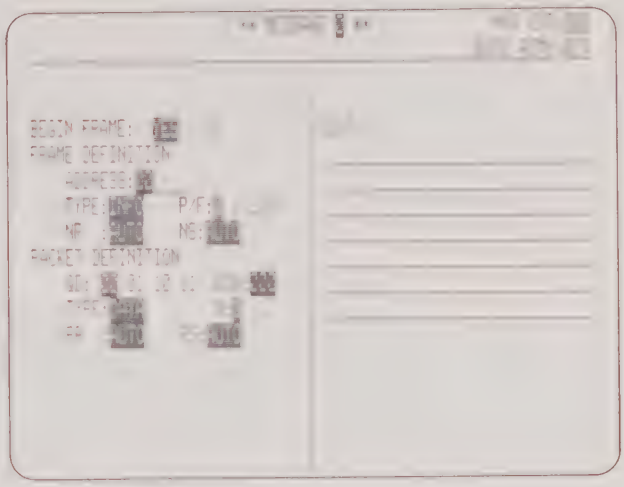


Figure 42-2

42
MESSAGE CONTENT RESOURCES

Each of the following can be sent, either singly or as part of a longer transmission, by entering a special symbol in the trigger Actions menu Text field:

(1) message-entry menus;
(2) keyboard buffer;
(3) receive buffers;
(4) factory-stored message;
(5) transmit variables.

42.1 MESSAGE-ENTRY MENUS

(a) Introduction. There are 16 message-entry menus (Figure 42-1) that (1) serve to increase the number of characters that may be included in a transmission and (2) give you a number of additional selections for frame and packet protocol which are not available in the trigger Begin Frame fields. To select a message-entry menu, first press the MESSAGE key, which displays the Message Summary; then press the number (0 - F) of the menu you want.

These menus are identical except for their identification numbers. Figure 42-1 shows a default message-entry menu for BISYNC protocol; Figure 42-2, the menu as it appears when 7E/X.25 FORMAT has been selected (the special FRAME and PACKET DEFINITION selections are explained in Section 49). The protocol selections and the text you type in are automatically entered in the message buffer, but you may alter the message at any time by changing the message-entry menu.

To transmit the text and (or) protocol from a message-entry menu, specify the number of the menu on the Xmit data-entry line of a Trigger Actions menu by depressing the ALT key as you enter the number of the message-entry menu. (See Section 41.3 for complete instructions.)

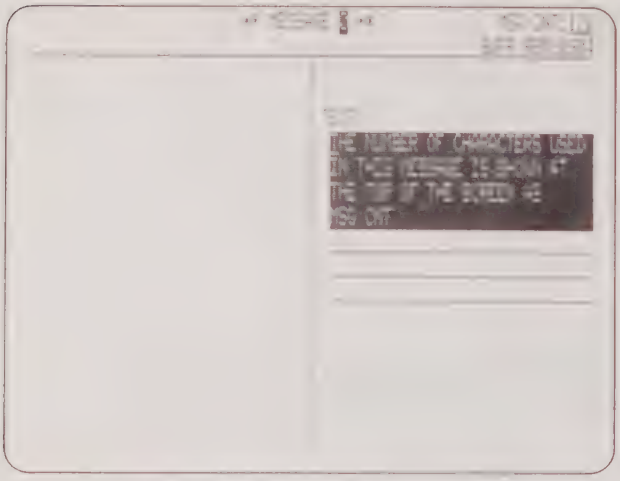


Figure 42-3

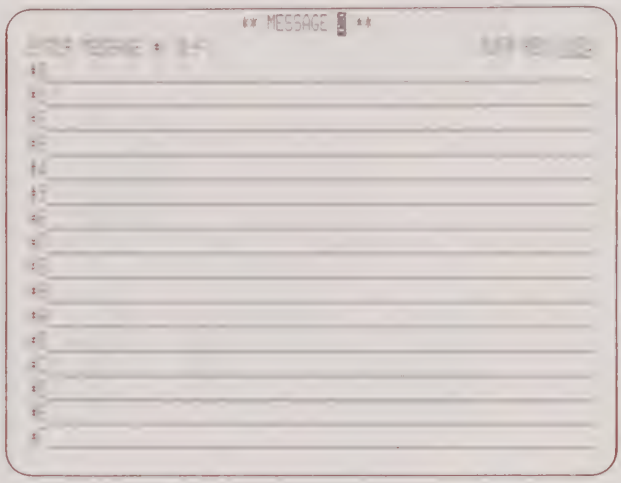


Figure 42-4

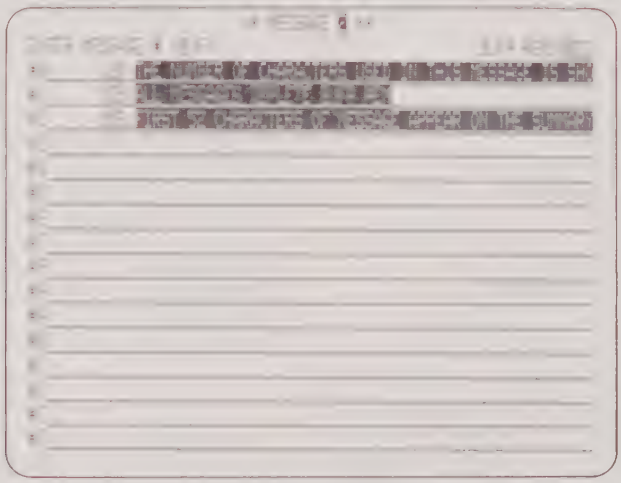


Figure 42-5

(b) Begin Frame. This selection is displayed only for the four X.25 and SDLC Format selections; it is explained in Section 49.3.

(c) Text. In this data-entry field you can type in a message to be transmitted by a trigger Xmit action. The maximum message length is 180 characters (not including the frame and packet definition selections). There are 16 message menus, but the total message buffer space is 1024 bytes, so if you enter a number of messages, not all of them can be of maximum length.

Always displayed in the upper right-hand corner of the menu are the total number of message characters currently entered in the message buffer (MSG CNT) and the total message buffer (BUFR REM) currently remaining (compare Figure 42-3 with Figure 42-1). Frame and Packet selections made on the left-hand side of the menu are not counted.

All alphanumeric, control, and hexadecimal characters are valid in the Text field. Hexadecimal entries are not translated and parity is not calculated on them. The FLAG key is invalid.

Press the MESSAGE key to return to the Message Summary and select another message-entry menu.

42.2 MESSAGE SUMMARY

Figure 42-4 shows the default Message Summary for BISYNC format. On Line 2, the Message Summary always displays the total message buffer space that is currently available (BUFfeR REMaining). For each Message-Entry menu, the Summary tells you the number of characters in the message and also shows the first 52 characters of the message to remind you of what messages are currently in the buffer (see Figure 42-5).

For the two SDLC formats, each message summary line is preceded by the mnemonic for the frame type selected on the message-entry menu. For the X.25 formats, if INFO frame is selected on a message-entry menu the packet type will be displayed at the beginning of the message summary line; otherwise, the frame type will be shown.

The Message Summary is your only entrance to the Message-Entry menus. While the Message Summary is displayed, you may enter any digit from 0 to F to obtain one of the 16 message-entry menus.

While a Message-Entry menu is displayed you may again view the Message Summary by pressing the MESSAGE key.

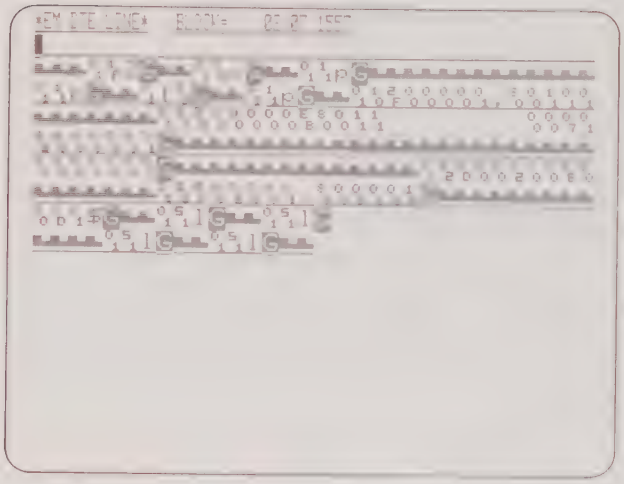


Figure 42-6

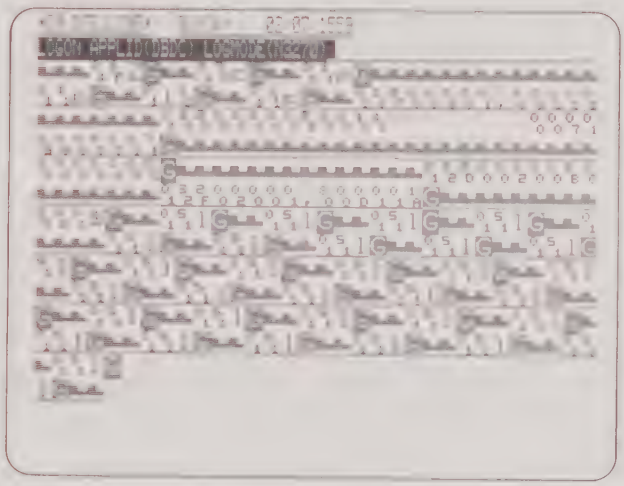


Figure 42-7

42.3 KEYBOARD BUFFER MESSAGES

You may type message text into the Keyboard Buffer while either data or one of the trace displays is on the screen. Manual freeze must not be on and Counters and Timers must not be displayed. The Keyboard Buffer holds 64 characters. Its content must be transferred to a Transmit Buffer before it can be transmitted. Like other messages, the Keyboard Transmit Buffer content is transmitted by triggers (see Section 41.3) but you may obtain manual control of the triggers (see Section 43.1) so that you can control both message content and moment of transmission in Run Mode. The procedure is as follows:

(1) First enter ALT-K (capital K for Keyboard) in the Text field of a Trigger Actions menu. You can provide framing and protocol bytes on the trigger Actions menu, or enter them in the Keyboard buffer as part of the text.

(2) While data or a trace is displayed -- but not manually frozen -- press the MESSAGE key. The second line of the display will clear and the cursor will appear in the first position of that line (see Figure 42-6). Type in a message of up to 64 characters. All alphanumeric, hexadecimal, and control characters are legal. The Flag key may not be used. As you type the message, it will be displayed on Line 2 (Figure 42-7). CLEAR FIELD clears the Keyboard Buffer. To make changes in this field, you can use cursor arrows, CTRL plus a cursor arrow, or SHIFT-CLEAR FIELD just as on the program menus.

(3) If the keyboard buffer message is not transferred to the Keyboard Transmit Buffer before the trigger acts, it will not be sent. There are two ways to transfer the keyboard message to the Keyboard Transmit Buffer:

- Press the MESSAGE key again. The Keyboard Buffer will be cleared and closed to keyboard access and Line 2 of the display will again display status information. Each time the trigger conditions come true, the message will be transmitted.

- Press the ENTER key. The message will be transferred to the Keyboard Transmit Buffer (overwriting any old message in the transmit buffer). The entry field on Line 2 will remain and you may enter another message in the Keyboard Buffer. Meanwhile, each time the trigger conditions are true, the message already in the Transmit Buffer will be sent.

(4) To clear the Transmit Buffer, press CTRL-CLEAR FIELD while the Keyboard Buffer entry field is displayed. This also clears the Keyboard Buffer.

CAUTION: Be sure to transfer your message to the Keyboard Transmit Buffer before you change the display by pressing CRT MAN FRZ or CNTR-TMR. In these cases, you will (1) lose the contents of the Keyboard Buffer and (2) lose access to the Keyboard Buffer. A message already in the Transmit Buffer will not be affected. HALT or CLEAR CRT will not affect either the Keyboard Buffer or the Transmit Buffer.

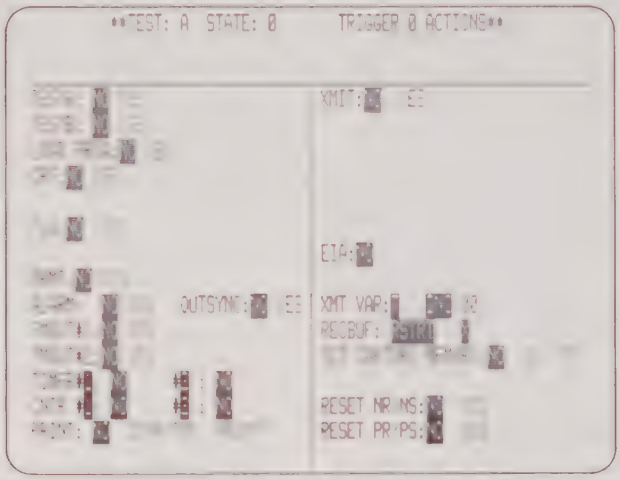

TEST: A STATE: 0 TRIGGER 0 ACTIONS
XMIT:
EE
EIA:
OUTSYNC:
EE
XMT VAR:
RECBUF:
RESET NR/NS:
RESET PR/PS:

Figure 42-8

42.4 RECEIVE BUFFERS; ECHO

There are two receive buffers, designated X and Y. Each can be loaded with up to 255 bytes of received data which can then be transmitted by entering ALT-X or ALT-Y in the Text field of a trigger Actions menu.

(a) Loading. To load a Receive Buffer, select RECBUF:START on the Trigger Actions menu (see Figure 42-8). Select X or Y to specify which receive buffer the trigger is to control. RESTART clears the buffer and starts loading it with received data; STOP causes the buffer to stop loading. The field which follows STOP indicates the number of bytes to be truncated at the end of the buffer. This is useful for removing received block check calculations and ending flags from a frame, for example. Valid entries in this field are 0 to 9. "Zero" indicates no truncation; "1" indicates that the last byte will be truncated, and so on.

In EM DTE mode, a Receive Buffer loads from the RD line; in EM DCE mode, it loads from the TD line. Data transmitted by COMSTATE II cannot be loaded into a Receive Buffer.

Receive Buffers generally should be used in controlled tests to ensure that only the data in which you are interested satisfies the conditions for loading the buffer.

NOTE: Triggers should not be set to load more than 255 bytes in a Receive Buffer. If you attempt to load more than 255 bytes in the buffer, only modulo 256 characters will be kept in the buffer; for example, if you try to load 258 bytes, only the last two will be kept.

NOTE: Only one receive buffer can be filled at a time. This means that you must be conscious of trigger sequencing when you use both buffers. When you have selected RESTART for one receive buffer, be sure to STOP loading that buffer before you RESTART the other receive buffer.

(b) Transmitting. To transmit the Receive Buffer contents, enter ALT-X or ALT-Y in the Text field of a trigger Actions menu (see Section 41.3 for complete instructions). Normally, header and trailer information must be sent along with the Receive Buffer. For instance, you might enter SY SY SY STX ALT-X ETX in the Text field; the text of the message would then be the Receive Buffer contents.

NOTE: If you set a trigger to send a Receive Buffer while it is being loaded (after it has been ReSTRTed but before it has been STOPped), nothing will be sent.

42.5 FACTORY-STORED MESSAGE

To transmit the factory-stored message, enter ALT-M on the Text line of a Trigger Actions menu (see Section 41.3). As with the Receive Buffer, the leading and trailing protocol characters must be added. The text of the stored message is as follows:

For unshifted code (54 characters):

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG 0123456789

For upper/lower case shifted code (56 characters):

^THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG 0123456789

For letters/figures shifted code (56 characters):

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG ^0123456789

42.6 TRANSMIT VARIABLES

COMSTATE II has Variable Counters which are controlled by the trigger Xmt Var action (Figure 42-8). To include a Variable Counter's 1-byte output in any transmission, enter ALT-T, ALT-U, ALT-V, or ALT-W in the XMIT: TEXT field of a trigger Actions menu. This counter may be set or incremented on the same trigger as the transmission in which it is to be included. The default selection is NO.

> NOTE: The Transmit Variables will not be adjusted for parity or for inverted or reversed data signals. You can adjust your set hexadecimal entry for these characteristics, but INCrement will ignore them.

(a) Increment: Use of 16-bit Counter Pairs. You should be aware before using the increment function that the transmit variables can be used in pairs: T and U can be used in tandem to form a 16-bit counter; transmit variables V and W can be used together in the same way. To take advantage of this capability, select U or W and INC as the trigger action. When the low-order counter -- Variable U or W -- is incremented past 255 (FF, hex), the count is carried to the high-order partner -- Variable T or V. This allows each pair to increment to a value of 65, 535 before wrapping to zero.

You may transmit either the low-order byte or the high-order byte by entering the appropriate letter in the transmit string. (Use the ALT key and the letter together.) To transmit the entire value of the 16-bit counter, enter the pair of letters (for example ALT-T followed by ALT-U) in the transmit string.

(b) Increment: Use of 1-byte Counter Variables. Any of the transmit variables -- T, U, V, or W -- can be incremented independently to form an 8-bit counter which reaches a count of 255 and then wraps to zero.

> NOTE: Variables T and U and Variables V and W form 16-bit counter pairs as described previously. To avoid unreliable counter values, do not increment or set the high-order member of the pair (T or V) at the same time that the low-order member of the pair (U or W) is incremented.

(c) Set and Reset (Data-Entry Field). To set the Transmit Variable Counter, move the cursor into the data-entry field to the right of the INC selection. Enter a two-digit hexadecimal number (the HEX key is illegal here). To reset the Transmit Variable Counter, enter 00 in the data-entry field.

(d) INC and XMIT on the Same Trigger. If the same trigger is used to increment the Variable Counter and to send the Variable Counter in a message, then the counter will increment once before it is sent. Thus -- when the INC and XMIT actions are taken by the same trigger -- if the value of the counter is 00 (hex) when the trigger comes true, the transmitted count will begin with 01. If you want the transmitted count to begin with 00, set the counter to FF on another trigger, so the counter will increment to 00 before transmission.

42.7 RESET NR/NS

This trigger action appears only for certain formats (SDLC, SDLC/NRZI, 7E/X.25, or BSC/X.25.) The default selection is NO. When YES is selected, the trigger internally resets values of NR and NS to zero in preparation for the COMSTATE II's next transmission.

NOTE: A numbered frame can be transmitted by a trigger which also resets NR and NS. The sequence numbers will be reset before the frame is transmitted, provided that automatic frame sequencing is used.

NOTE: Reset NR/NS also resets an Outstanding Frame condition so that the next anticipated NR is zero.

(a) Automatic Sequencing. Reset NR/NS is an extension of the COMSTATE II's automatic frame sequencing. Consequently, if another numbered frame is received (or sent) between the RESET and the next anticipated COMSTATE II transmission, frame sequence numbers will increment automatically.

(b) Forced Sequencing. If you wish to force the frame sequence numbers to a fixed value for a particular transmission, use a message menu (see Section 42.1).

Any frame sent from the message menu with forced sequence numbers (fixed numbers, LAST REC NR, or SKIP selected) will override automatic sequencing, including the Reset NR/NS action.

42.8 RESET PR/PS

This trigger action is available only for 7E/X.25 and BSC/X.25. It is used to reset packet sequencing numbers to zero for a specific logical channel number. The default selection is NO. When YES is selected, another field, LCN, appears. Specify in hex the number of the logical channel for which PS and PR are to be reset. When the trigger comes true, the COMSTATE II resets these values internally in anticipation of the next COMSTATE II transmission on the logical channel indicated.

NOTE: A packet can be transmitted by a trigger which also resets PR and PS. In this case, the sequence numbers will be reset to zero before the packet is transmitted, as long as automatic packet sequencing is used.

(a) LCN Loopback. If the LCN field is left blank (see Figure 42-9), the COMSTATE II resets PR and PS to zero for the last logical channel number received. (Use the CLEAR FIELD key to remove LCN entries.)

(b) Automatic Versus Forced Sequencing. Reset PR/PS is part of the COMSTATE II's automatic sequencing feature. Hence, packets received (or sent) on the specified LCN between the RESET and the COMSTATE II's next anticipated transmission will cause the packet sequence numbers for that LCN to increment automatically. If you wish to force packet sequence numbers to a fixed value, enter the packet information on a message menu. (See Section 42.1.)

A packet entered on a message menu with forced sequence numbers (fixed numbers, LAST REC PR, or SKIP selected) will override automatic sequencing, including a Reset PR/PS action intended for that packet.

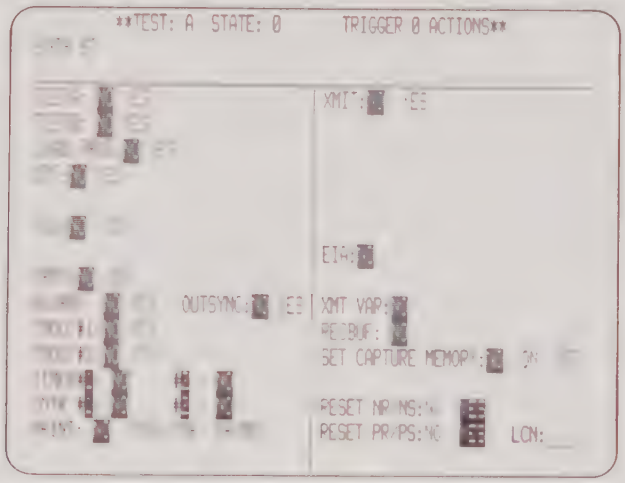

TEST: A STATE: 0 TRIGGER 0 ACTIONS
XMIT:
EIA:
OUTSYNC:
XMT VAR:
RECBUF:
SET CAPTURE MEMORY:
RESET PR/PS:
LCN:

Figure 42-9

43
TRANSMISSION CONTROL: OTHER TRIGGER SELECTIONS

43.1 MANUAL TRANSMISSIONS

Although all COMSTATE II transmissions are trigger actions, you can control the triggers manually using either of two trigger conditions, ENTER and KYBD. Manual control is especially useful for sending Keyboard Buffer messages (see Section 42.3 for a complete discussion of the Keyboard Buffer).

(a) Marker. When the data source is line, the ENTER key puts a marker on the CRT, and on tape if interface leads are being recorded. To have a trigger look for the Marker, select EIA:YES on the Conditions menu (see Figure 43-1) and enter a 1 (or 0) in the MKR field. Then designate the message or messages to be sent in the Set Xmit field of the Actions menu.

Whenever the ENTER key is depressed (or released, if 0 is selected) in Run Mode, the trigger will be true and the message will be sent.

(b) Keyboard. The KYBD trigger condition allows you to select any key from the ASCII keyboard area as a trigger condition. Select KYBD:YES (Figure 43-1) and enter the key in the KEYS field. The trigger will then be true whenever that key is pressed.

This condition will give you manual control over a number of different transmissions, since you can select a different key for each trigger.

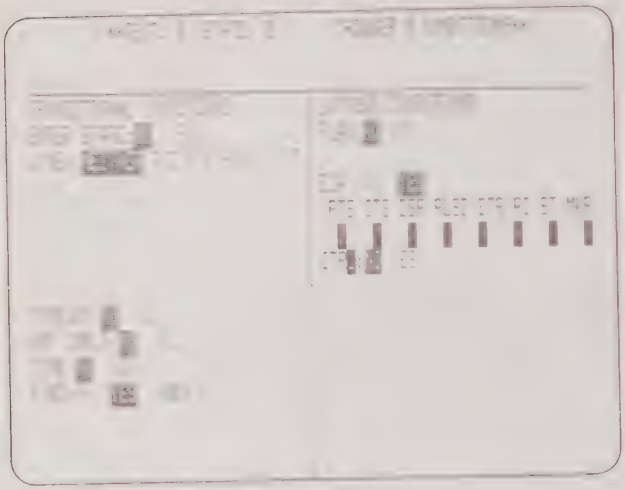


Figure 43-1

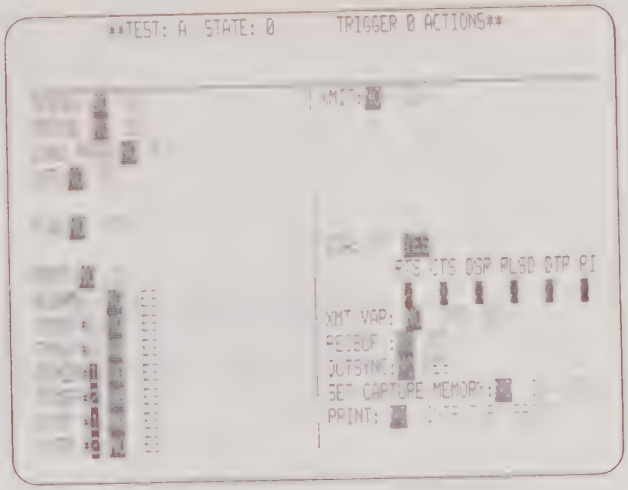


Figure 43-2

43.2 MESSAGE FLOW CONTROL

The MSG FLOW action is intended for use only in asynchronous operation. It is especially useful for testing printers. It allows triggers to suspend a transmission by another trigger, then resume the transmission without loss of data. COMSTATE II control of the interface is not affected by this action. The selections are SUSPEND and CONTinue. If a trigger with a SUSPEND action comes true between transmissions, neither the SUSPEND nor the CONT action will affect the data line.

43.3 INTERFACE LEAD CONTROL

Selecting EIA:YES on a trigger Actions menu (Figure 43-2) allows the trigger to control any of six interface leads (RTS, CTS, DSR, RLSD, DTR, and RI) that the COMSTATE II controls in the current Emulate Mode. Table 31-1 shows which leads are controlled in each Emulate Mode. Enter 1 if you want the trigger to turn a lead ON; and 0 if you want the trigger to turn it OFF. For X, no action will be taken. If you enter 1 or 0 for a lead not being controlled in the current Emulate Mode, your entry for that lead will be ignored.

The Parameter 4 interface control logic and the trigger interface control logic are independent of each other. Therefore each may override the other: if, for instance, a trigger turns RTS on, the Parameter 4 logic may turn it off; if Parameter 4 turns CTS off, a trigger may turn it back on. If either tries to turn off (or on) a lead that is already off (or on), there will be no change.

43.4 TRANSMISSION COMPLETE CONDITION

The XMT CMPLT field appears on the Trigger Conditions menus only if you have selected one of the Emulate Modes on the Parameter 1 menu. The default choice is OFF. When YES is selected the trigger looks for the end of a transmission by the COMSTATE II. The XMT CMPLT condition usually should be used with another condition to control when, or how many times, it will be tested.

A transmission is defined as all messages entered in the XMIT data-entry field of a trigger. In full-duplex operation, End of Transmission usually is the last character in the last message entered in the XMIT field if received Block Check (Parameter 1) is not on, or the second Block Check Character if received Block Check is on. However, in Switched carrier, Em Drop, and Em Host modes (Parameter 4; Section 38) a transmission is not considered complete until all of the interface handshaking is complete.

43.5 OUTSTANDING FRAME

This condition appears only for the four X.25 and SDLC Format selections. Please see Section 49.12 for instructions.

43.6 NS REC ERROR

This condition appears only for the four X.25 and SDLC Format selections. Please see Section 49.12 for instructions.

43.7 PS REC ERROR

This condition appears only for the two X.25 Format selections. Please see Section 49.12 for instructions.

43.8 LOOPBACK

The COMSTATE II's ability to transmit to itself can be put to good use for training purposes. The procedure is as follows:

(1) Be sure that no data lines are connected at the rear of the unit.

(2) When you select Emulate DCE Mode, INT CLOCK will be selected automatically. For EM DTE, be sure to select INT CLOCK.

(3) Select LINE as the SOURCE. Choose the appropriate code and format.

(4) The default Parameter 4 menu is acceptable for this purpose because there will be no switched leads to serve as references for delay times.

(5) Remember that all transmissions are under trigger control, so you must set triggers to transmit. There is no incoming data to trigger on, but you can use the ENTER STATE condition in State 0 of either test to start a transmission. The first transmission will provide you with other possible trigger sources (End of Transmission or a DCE string, for example) for further transmissions.

NOTE: The Receive Buffer cannot be used as it will not load data from the Transmit side of the line.

The display will show COMSTATE II transmissions as they are received from the line. For EM DTE mode, you will see TD data (Pin 2); in EM DCE mode, you will see RD (Pin 3) data. The block check characters you see will be the transmitted characters. If Received Block Check is ON, the second block check character will be replaced by G or B because the COMSTATE II is receiving and checking its own transmissions.

44
HIGH-SPEED MODE

44.1 SELECTING HIGH-SPEED OPERATION

High-Speed Mode is selected in the HIGH SPEED field of the Parameter 1 menu. It is intended for use with the High-Speed Memory (RAM) at line data speeds above 19.2 kbps and up to 64 kbps. It can be used for ASYNC or NRZI operation as well as in synchronous modes. It should not be used for tape or RAM playback.

CAUTION: Do not attempt to record on tape at data speeds above 19.2 kbps. The tape will not record properly and it may run off the reel; the COMSTATE II may lock up. Should the latter occur, the only way to regain control of the unit may be to turn it off and then on again.

Up to four optional crystals (labeled X1, X2, X3, and X4 on the Parameter 1 menu) may be installed in the COMSTATE II to provide high-speed internal clocks for speeds above 19.2 kbps or for applications of nonstandard speeds above 2400 bps. Speed selections are explained in Section 17.3.

Either SINGLE or DUAL may be selected on the Parameter 2 menu in the DISPLAY MODE field.

44.2 BLOCK CHECK CALCULATIONS

Received block check is always on for 7E-framed bit-oriented protocols. Block checking will also be done automatically for BSC/X.25 protocols. In BISYNC operation, it is preferable to select NO for REC BLK CK on the Parameter 1 menu.

44.3 PROGRAM OPERATION

In High-Speed Mode, Test A will function just as in other modes, with 128 states and triggers available. Test B is not operational.

All trigger Conditions and Actions are valid selections in High-Speed Mode. However, to increase the line data speed at which programs will operate correctly, they should be streamlined by (1) limiting the number of trigger conditions selected, and (2) limiting conditions to those that can be analyzed quickly such as simple string searches.

44.4 BIT-ORIENTED PROTOCOLS

For 7E/X.25, SDLC, or SDLC/NRZI, when MONitor Mode is selected the display will be that normally expected for these protocols.

When an EMulate mode is selected --

- No flags will be shown on the display.
- Triggers will see only one flag between frames. Therefore triggers cannot find strings of more than one flag or count flags.

45
BIT-ORIENTED PROTOCOLS: GENERAL INFORMATION

Sections 45 through 47 bring together special information to help you use the COMSTATE II in systems with bit-oriented protocols. This section contains general background material. Section 46 contains information you need to use the trigger LINE condition effectively. The COMSTATE II does automatic protocol analysis, which is incorporated into a number of special display features; these are discussed in Section 47. For transmitting bit-oriented protocols, there are protocol mnemonic selections as well as a number of special trigger conditions; please see Section 49 for these.

45.1 FORMAT SELECTIONS (PARAMETER 1 MENU)

There are three selections for HDLC-framed protocols in the Parameter 1 FORMAT field (see Figure 45-1): 7E/X.25; SDLC; and SDLC/NRZI. In addition, BISYNC framing can be obtained by selecting BSC/X.25.

No matter which format you intend to use, select the correct CODE for your data and, if applicable, the number of information BITS and PARITY also.

(a) HDLC Framing. Selecting 7E/X.25, SDLC, or SDLC/NRZI for FORMAT automatically determines 7E (hex) framing with zero bit insertion.

(b) BISYNC Framing. For BSC/X.25, the synchronization characters default according to the code selected but you may enter any synchronization characters by writing over the SY SY in the SYNC CHARS field. OUTSYNC should be changed to at least two FFs (hex), because if the unit goes out of synchronization on an FF (hex) in the frame check sequence, it may confuse the automatic frame and packet locators.

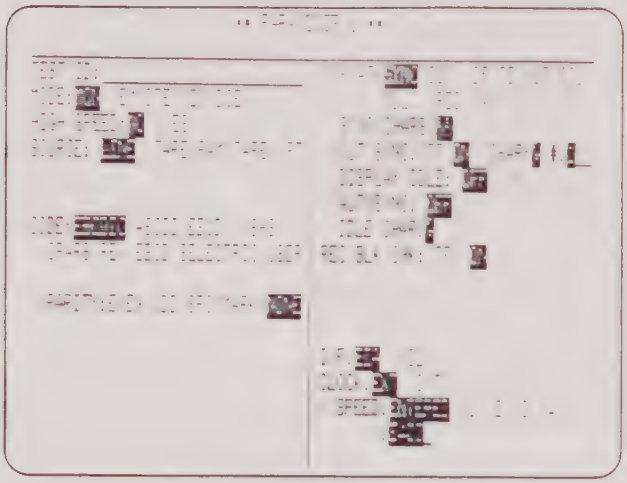


Figure 45-1

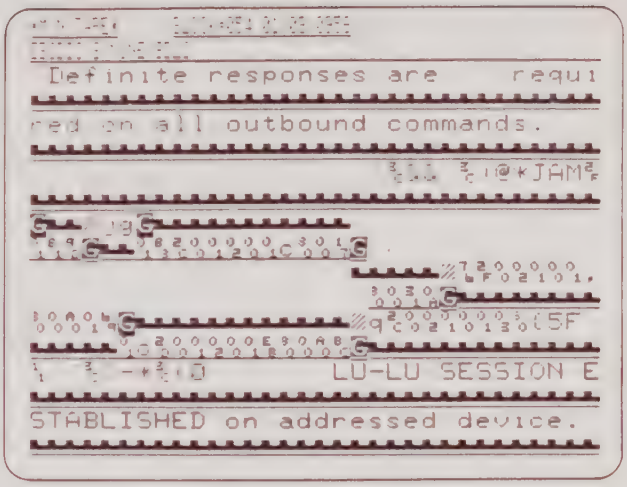


Figure 45-2 Dual-line display, CTRL-HEX on.

45.2 FRAME- AND PACKET-LEVEL MNEMONICS

For both X.25 and SDLC-SNA, the COMSTATE II provides a comprehensive set of mnemonic selections for monitoring and transmitting frame (level 2) protocol. For X.25, there are also packet (level 3) protocol mnemonic selections.

Table 45-1 lists the frame-level mnemonics for X.25 and SDLC-SNA. The X.25 set includes LAP B and LAP D. It also applies to X.75. Table 45-3 gives the packet-level mnemonics that are available for 7E/X.25 and BSC/X.25.

45.3 SNA TRACE

An additional selection is available for SDLC-SNA analysis. SNA Trace groups bytes within the frame into meaningful fields and provides an analysis of these fields. Refer to Section 48 for a description of SNA Trace.

45.4 DISPLAY CONTROL

(a) Display Idle. For BSC/X.25, the DISPLAY IDLE selection under the FORMAT line of the Parameter 1 menu can be used. For the 7E-framed formats, flags are automatically displayed and the Display Idle selection is not present.

(b) Dual-Line Display. The DUAL selection for DISPLAY MODE on the Parameter 2 menu is useful for displaying full-duplex data. It selects dual-line display and inserts a low-intensity L-shaped fill symbol in the data for each unused character time to maintain time correlation between TD and RD (see Figure 45-2).

(c) Hexadecimal Display. For BSC/X.25, 7E/X.25, SDLC, and SDLC/NRZI, CTRL-HEX is on when Run Mode is entered (Figure 45-2). All control characters for the data code selected on the Parameter 1 menu are displayed in hexadecimal. You may alternately override this to see control character mnemonics by repeating CTRL-HEX (Figure 45-3). The HEX key alone will alternately display all data in hexadecimal just as it does for other formats.

(d) Displaying Aborts Between Frames. The Display Abort selection is shown under the FORMAT field on the Parameter 1 menu when 7E/X.25, SDLC, or SDLC/NRZI is selected. For OFF, aborts that occur between frames are not displayed; for ON, aborts between frames are displayed. Aborted blocks are always displayed and identified by a bright reverse-image A.

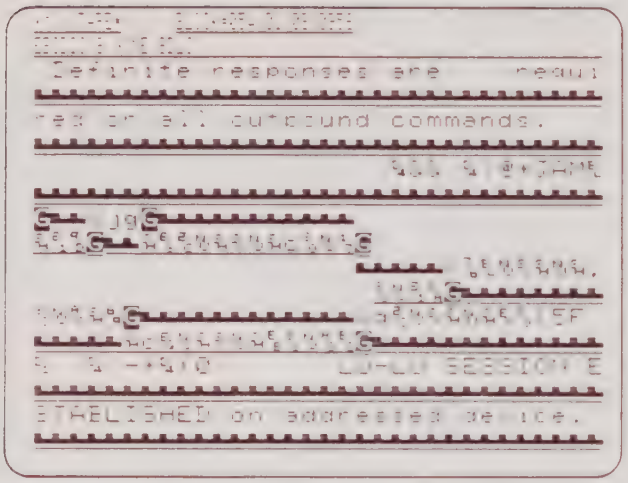


Figure 45-3 Dual-line display, CTRL-HEX off, flags suppressed.

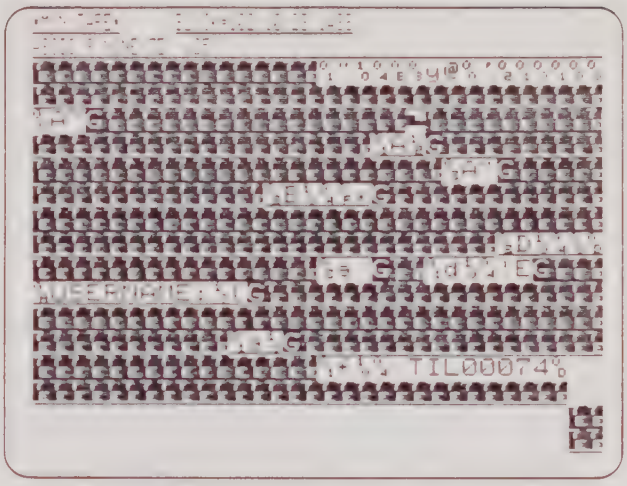


Figure 45-4 HDLC display when flags are not suppressed.

45.5 HDLC FLAGS (7E, hex)

(a) Display. In both Program and Run Mode, 7E (hex) flag bytes are always displayed in low-intensity reverse image (Figure 45-4) to distinguish them from transparent data 7E (hex).

(b) Program Entries. To enter the flag byte on a program menu always use the special dark gray FLAG key at the upper right of the alphanumeric key area. The flag will appear on the menu as a low-intensity 7E (hex).

NOTE: The logic will not read a hexadecimal entry made with the HEX key as a flag.

(c) Suppressing Display of Flags. Idle flags may be suppressed from the display by entering FLAG in the SUPPRESS field on the Parameter 2 menu (compare Figures 45-4 and 45-3).

45.6 BLOCK CHECK CALCULATIONS FOR HDLC FRAMING

For formats with HDLC framing (7E/X.25, SDLC, and SDLC/NRZI), the COMSTATE II will do block check calculations on both received and transmitted data. The block check polynomial is automatically CRC-CCITT, X16 + X12 + X5 + 1 and block check parameters are not selectable. The block check starts with the address byte and stops at the end of the frame check sequence. Inserted zero bits are ignored. No block check is calculated following seven consecutive 1's (aborted frame).

For these formats, Received Block Check is always ON and the REC BLK CHK selection is absent from the Parameter 1 menu. On the data display, the second frame check byte (FCS) is replaced by a low-intensity, reverse-image G for a Good block check or by a bright reverse-image B for a Bad block check.

You may transmit messages with either good or bad BCCs and you may also transmit aborts. The transmitted block check or Abort is chosen in the Xmit field of a Trigger Actions menu (see Section 41).

45.7 BLOCK CHECK CALCULATIONS FOR BISYNC FRAMING

For the Parameter 1 selection BSC/X.25, or BISYNC-framed HDLC, the software defaults to Received Block Check ON, but you may select OFF on the Parameter 1 menu.

When Received Block Check is ON, a Good BCC is shown by replacing the second block check character with a low-intensity reverse-image G; for a Bad BCC, the second character is replaced by a bright reverse-image B. Aborted blocks are not indicated.

When Received Block Check is OFF, no received data block check calculations are done except for the frame and packet protocol mnemonic display. When data is displayed, both block check characters actually received or transmitted by the COMSTATE II are displayed. Block check calculations may still be transmitted (selected on the XMIT line of a Trigger Actions menu), but the G and B symbols will not be displayed.

The block check polynomial is automatically CRC-16, X16 + X15 + X2 + 1 and BCC parameters are not selectable. Block check starts with DLE STX and stops with DLE ETX. The calculation ignores DLE whenever it is followed by any character except SY. When DLE is followed by SY, both are ignored. No Block Check is calculated following DLE ENQ (abort).

TABLE 45-1
FRAME-CONTROL MNEMONICS

Bit Pattern								SDLC or SDLC NRZI		7E/X.25 or BSC/X.25	
8	7	6	5	4	3	2	1	Mnemonic	Definition	Mnemonic	Definition
	N(R)		P		N(S)		0	INFO	INFOrmation	INFO (1)	INFOrmation
	N(R)		P/F	0	0	0	1	RR	Receiver Ready	RR (1)	Receiver Ready
	N(R)		P/F	0	1	0	1	RNR	Receiver Not Ready	RNR (1)	Receiver Not Ready
	N(R)		P/F	1	0	0	1	REJ	REJect	REJ (1)	REJect
	N(R)		P/F	1	1	0	1	SREJ	Selective REJect	SREJ (1)	Selective REJect
0	0	0	P/F	0	0	1	1	UI	Unnumbered Information	UI	Unnumbered Information
0	0	0	P/F	0	1	1	1	SIM/RIM	Set Initialization Mode/Request Initialization Mode	---	---
0	0	0	F	1	1	1	1	SARM/DM	Set Asynchronous Response Mode/ Disconnect Mode	DM	Disconnect Mode
0	0	1	P/F	0	0	1	1	UP	Unnumbered Poll	---	---
0	0	1	P	1	1	1	1	---	---	SABM	Set Asynchronous Balance Mode
0	1	0	P	0	0	1	1	DISC/RD	DISConnect/ReQuest Disconnect	DISC	DISConnect
0	1	0	P/F	0	1	1	1	RGA (2)	Remote Go-Ahead	---	---
0	1	1	F	0	0	1	1	UA	Unnumbered Acknowledge	UA	Unnumbered Acknowledge
0	1	1	P/F	0	1	1	1	---	---	SIO	Sequenced Information 0
0	1	1	P	1	1	1	1	---	---	SABME (3)	Set Asynchronous Balance Mode, Extended
1	0	0	F	0	1	1	1	FRMR	FRaMe Reject	FRMR	FRaMe Reject
1	0	0	F	0	0	1	1	SNRM	Set Normal Response Mode	---	---
1	0	1	P/F	1	1	1	1	XID	eXchange station ID	XID	eXchange station ID
1	1	0	P/F	0	1	1	1	CFGR	ConFIGuRe	---	---
1	1	1	P/F	0	0	1	1	TEST	lInk TEST	---	---
1	1	1	P/F	0	1	1	1	---	---	SII	Sequenced Information 1
1	1	1	F	1	1	1	1	BCN	BeaCoN	---	---
All other patterns									UNKNOWN		UNKNOWN

Note 1: Bit pattern applies only to X.25 Modulo 8 Information or Supervisory Frame. For Control Bytes of Information and Supervisory Frames in X.25 Modulo 128, see Table 45-2.

Note 2: Bit pattern is defined when frame is analyzed; however, frame must be transmitted using "Other" selection in frame-type window, with hexadecimal value of frame control byte specified.

Note 3: X.25 Modulo 128 frame type.

TABLE 45-2
FRAME-CONTROL BYTES AND MNEMONICS (MODULO 128)
FOR SUPERVISORY AND INFORMATION FRAMES

Bit Pattern																X.25 Modulo 128	
First transmitted octet								Second transmitted octet									
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	Mnemonic	Definition
N(S)							0	N(R)							P	INFO	INFOrmation
0	0	0	0	0	0	0	1	N(R)							P/F	RR	Receiver Ready
0	0	0	0	0	1	0	1	N(R)							P/F	RNR	Receiver Not Ready
0	0	0	0	1	0	0	1	N(R)							P/F	REJ	REJect
0	0	0	0	1	1	0	1	N(R)							P/F	SREJ	Selective REJect

TABLE 45-3
PACKET-TYPE MNEMONICS

Octet 3								Display		
8	7	6	5	4	3	2	1	(XXX=HEX 000-FFF)	Mnemonic	Definition
0	0	0	0	1	0	1	1	LCN = XXX	CALL	CALL Request
0	0	0	0	1	1	1	1	LCN = XXX	CALL ACC	CALL ACCept
0	0	0	1	0	0	1	1	LCN = XXX	CLEAR	CLEAR Request
0	0	0	1	0	1	1	1	LCN = XXX	CLEAR C	CLEAR Confirm
P(R)			M		P(S)		0	LCN = XXX	DATA (1)	DATA
1	1	1	1	0	0	0	1	LCN = XXX	DIAG	DIAGnostic
0	0	1	0	0	0	1	1	LCN = XXX	INT	INTerrupt
0	0	1	0	0	1	1	1	LCN = XXX	INT CONF	INTerrupt CONFirm
P(R)			0	0	0	0	1	LCN = XXX	RR (1)	Receiver Ready
P(R)			0	0	1	0	1	LCN = XXX	RNR (1)	Receiver Not Ready
P(R)			0	1	0	0	1	LCN = XXX	REJ (1)	REJect
0	0	0	1	1	0	1	1	LCN = XXX	RESET	RESET Indication
0	0	0	1	1	1	1	1	LCN = XXX	RESET C	RESET Confirm
1	1	1	1	1	0	1	1	LCN = XXX	RSTRT	ReSTaRT Request
1	1	1	1	1	1	1	1	LCN = XXX	RSTRT C	ReSTaRT Confirm
P(R)			0	1	1	0	1	LCN = XXX	SREJ (1)	Selective REJect
All other									UNKNOWN	

Note 1: Applies to X.25 Modulo 8 only. For Modulo 128 packet identifiers, see Table 45-4.

TABLE 45-4
BIT PATTERNS AND PACKET MNEMONICS FOR MODULO 128 SEQUENCED PACKETS

Octet 3								Octet 4									
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	Mnemonic	Definition
P(S)							0	P(R)							M	DATA	DATA
0	0	0	0	0	0	0	1	P(R)							0	RR	Receiver Ready
0	0	0	0	0	1	0	1	P(R)							0	RNR	Receiver Not Ready
0	0	0	0	1	0	0	1	P(R)							0	REJ	REJect
0	0	0	0	1	1	0	1	P(R)							0	SREJ	Selection REJect

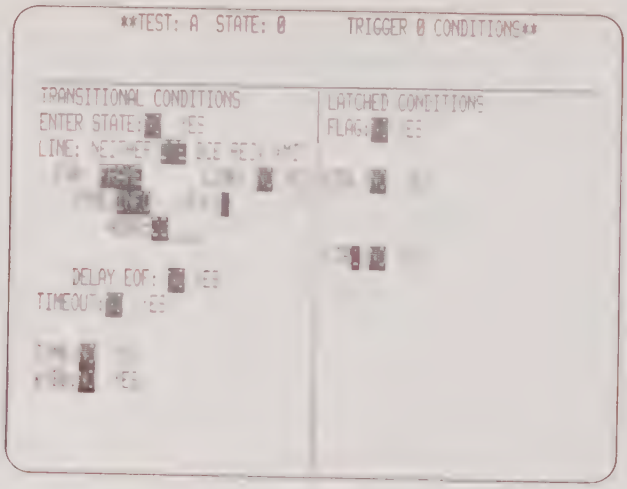
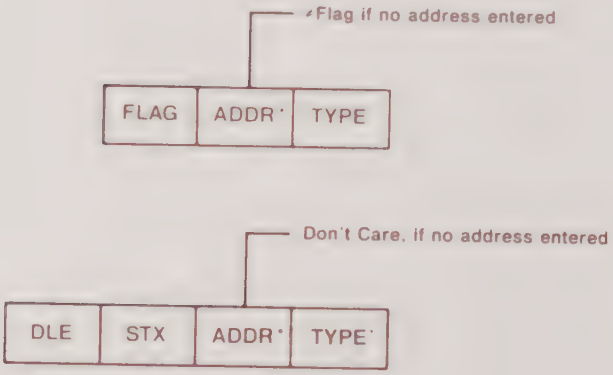


Figure 46-1 Note fields enabled by FRAME selection on FOR line.



*Frame Address Length 1–3 bytes as selected on Parameter 1.
†Type length 2 bytes for X.25 Modulo 128 Information and Supervisory frames; otherwise 1 byte.

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Figure 46-2 Strings trigger logic looks for when FRAME is selected: top, 7E/X.25, SDLC, or SDLC/NRZI; bottom, BSC/X.25. See Table 46-1 for frame TYPEs.

46
BIT-ORIENTED PROTOCOLS: TRIGGER STRING SEARCHES

Sections 20.3 through 20.8 explain trigger string searches in general; this section adds material specific to bit-oriented protocols.

46.1 INSERTED ZERO BITS

When 7E/X.25, SDLC, or SDLC/NRZI is selected, the COMSTATE II string search logic ignores inserted zero bits. You can specify the search string on the trigger conditions menu without considering zero bit insertion.

46.2 INSERTED DLEs

If BSC/X.25 has been selected on the Parameter 1 menu, the COMSTATE II does not see inserted DLE and DLE SYN in string searches even though it does display and record them. Once the COMSTATE II has seen a DLE STX, it will ignore all leading DLE's until the end of the frame, and this enables it to ignore inserted DLE's and DLE SYN's.

In this protocol, the end-of-frame sequence is DLE ETX. The COMSTATE II will not detect DLE ETX since it will ignore the DLE. To find an end-of-frame sequence in BSC/X.25, use the string ETX DC DC FF.

46.3 FRAME CONDITION

For BSC/X.25, 7E/X.25, SDLC, and SDLC/NRZI, the Trigger LINE conditions include FOR: FRAME (see Figure 46-1). Figure 46-2 shows the strings the trigger logic will look for when FRAME is selected.

TABLE 46-1
FRAME-TYPE SELECTIONS ON TRIGGER CONDITIONS MENUS

TYPE Selection	Definition	Bit Pattern (1) 8	7	6	5	4	3	2	1	
USE ROLL KEY TO START HERE										
INFO	INFOrmation	X	X	X	P/F	X	X	X	0	(2)
RR	Receiver Ready	X	X	X	P/F	0	0	0	1	(2)
RNR	Receiver Not Ready	X	X	X	P/F	0	1	0	1	(2)
REJ	REJect	X	X	X	P/F	1	0	0	1	(2)
SREJ	Selective REJect	X	X	X	P/F	1	1	0	1	(2)
SARM/DM	Set Asynchronous Response Mode	0	0	0	P/F	1	1	1	1	
SABM	Set Asynchronous Balanced Mode	0	0	1	P/F	1	1	1	1	
DISC/RD	DISConnect	0	1	0	P/F	0	0	1	1	
UA	Unnumbered Acknowledgment	0	1	1	P/F	0	0	1	1	
FRMR	FRaMe Reject	1	0	0	P/F	0	1	1	1	
TEST	link TEST	1	1	1	P/F	0	0	1	1	
XID	eXchange station ID	1	0	1	P/F	1	1	1	1	
SNRM	Set Normal Response Mode	1	0	0	P/F	0	0	1	1	
UI	Unnumbered Information	0	0	0	F	0	0	1	1	
SIM/RIM	Set Initialization Mode/ Request Initialization Mode	0	0	0	P/F	0	1	1	1	
UP	Unnumbered Poll	0	0	1	P	0	0	1	1	
CFGR	ConFiGuRe	1	1	0	P/F	0	1	1	1	
BCN	BeaCoN	1	1	1	F	1	1	1	1	
SABME	Set Asynchronous Balanced Mode, Extended	0	1	1	P/F	1	1	1	1	
SIO	Sequenced Information 0	0	1	1	P/F	0	1	1	1	
SI1	Sequenced Information 1	1	1	1	P/F	0	1	1	1	
OTHER 00	User-defined frame type	Enter hexadecimal equivalent of bit pattern desired by writing over 00. If there is no entry, the logic will look for 0000 0000 in the frame control byte (or the first-received frame control byte for X.25 Modulo 128 frames).								
USE CTRL-ROLL TO START HERE										

Note 1: X = Don't Care; P/F value is entered on Conditions Menu.

Note 2: Does not apply to X.25 Modulo 128. For Modulo 128 Information and Supervisory Frames, see Table 46-2.

The TYPE field is a window field like the FOR field. The Frame selections in the rotation are INFO, RR, RNR, REJ, SREJ, SARM/DM, SABM, DISC/RD, UA, FRMR, TEST, XID, SNRM, UI, SIM/RIM, UP, CFGR, BCN, SABME, SI0, SI1, and OTHER 00, in that order. Table 46-1 defines these selections. An X in the bit pattern in Table 46-1 means Don't Care; the string search logic will ignore this bit.

In the P/F field, enter 1 or 0 if you want the P/F bit to be monitored. The default entry is X, Don't Care.

In the ADDR field, enter two characters for each hexadecimal byte in the frame address. (The address may be one to three bytes long. The length of the frame address being sought is determined by the FRAME ADDR LENGTH selected on the Parameter 1 menu. Default length is one byte.) Only characters 0 through 9 and A through F are legal in the Frame Condition ADDR field.

If there is no entry in the ADDR field, the string search will accept any address. For additional information on frame address entries, refer to Section 49.14.

TABLE 46-2
X.25 MODULO 128 INFORMATION AND SUPERVISORY FRAME TYPE SELECTIONS ON TRIGGER CONDITIONS MENUS

TYPE Selection	Definition	Bit Pattern First-Received Control Byte (1) 8 7 6 5 4 3 2 1	Bit Pattern Second-Received Control Byte 8 7 6 5 4 3 2 1
INFO	INFOrmation	X X X X X X X 0	X X X X X X X P
RR	Receiver Ready	0 0 0 0 0 0 0 1	X X X X X X X P/F
RNR	Receiver Not Ready	0 0 0 0 0 1 0 1	X X X X X X X P/F
REJ	REJect	0 0 0 0 1 0 0 1	X X X X X X X P/F
SREJ	Selective REJect	0 0 0 0 1 1 0 1	X X X X X X X P/F

Note 1: X = Don't Care. P/F value is entered on Conditions Menu.

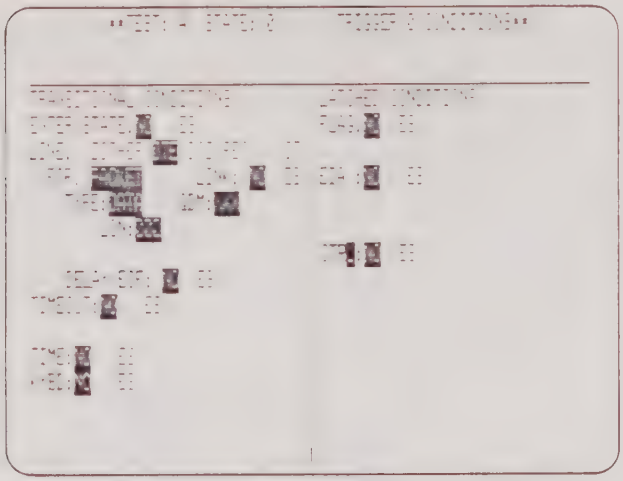
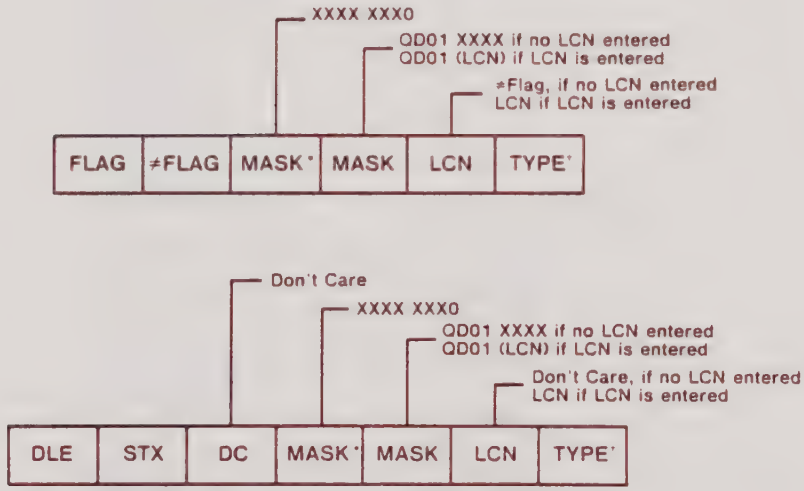


Figure 46-3 Note fields enabled by PACKET selection on FOR line.



*For X.25 Modulo 128, Mask is two bytes long: XXXX XXXX XXXX XXX0.
†For X.25 Modulo 128, Packet Type Identifier is 2 bytes long for data and supervisory packets.

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Figure 46-4 Strings trigger logic looks for when PACKET is selected: top, 7E/X.25; bottom, BSC/X.25. See Table 46-3 for packet TYPEs.

46.4 PACKET CONDITION

This selection (Figure 46-3) will appear in the FOR window only for BSC/X.25 and 7E/X.25. Figure 46-4 shows the strings the trigger logic will look for when PACKET is selected.

The packet TYPE selections that can be rotated into the TYPE window are defined in Table 46-3.

In the LCN field enter a three-digit hexadecimal number for the logical channel number you want the trigger to look for. Only keys 0 through 9 and A through F are legal. If there is no entry in the LCN field, the string search will ignore the LCN. If only 1 or 2 digits are entered in the LCN field, the logic will regard them as the lower-order bits and look for zeros in the high-order positions.

QDM is the last PACKET field. Enter 1 or 0 in the first position in the field if you want the trigger to look for the Q bit, in the second position for the D bit, and in the third position to look for the M bit. Enter an X to have the search logic ignore a bit (X, Don't Care, is the default entry.)

If the Q, D, or M bit has no meaning for the currently selected packet TYPE, the search logic will ignore it even if a 1 or 0 has been entered in that position in the QDM field.

46.5 DELAY UNTIL END OF FRAME CONDITION

When you want to transmit in response to a received string select DELAY EOF:YES to ensure that the logic sees and evaluates the block check on the received frame before the COMSTATE II transmission. This will prevent acknowledgment of a bad frame, as the string condition will then not be true for a bad or aborted block.

46.6 ABORT CONDITION

For 7E/X.25, SDLC, and SDLC/NRZI, FOR: ABORT may be selected. The Abort condition is not available for BSC/X.25.

TABLE 46-3
PACKET-TYPE SELECTIONS ON TRIGGER CONDITIONS MENUS

TYPE Selection	Definition	Bit Pattern (1) 8 7 6 5 4 3 2 1
USE ROLL KEY TO START HERE		
DATA	DATA	X X X M X X X 0 (2)
RR	Receiver Ready	X X X 0 0 0 0 1 (2)
RNR	Receiver Not Ready	X X X 0 0 1 0 1 (2)
REJECT	REJECT	X X X 0 1 0 0 1 (2)
INT	INTerrupt	0 0 1 0 0 0 1 1
INT CNF	INTerrupt CoNFirm	0 0 1 0 0 1 1 1
DIAG	DIAGnostic	1 1 1 1 0 0 0 1
OTHER 00	User-defined packet type	Enter hexadecimal equivalent of bit pattern desired by writing over 00. If there is no entry, logic will look for 0000 0000 (in first-received packet-type octet if X.25 Modulo 128).
RSTRT C	ReSTaRT Confirm	1 1 1 1 1 1 1 1
RSTRT R	ReSTaRT Request	1 1 1 1 1 0 1 1
RESET C	RESET Confirm	0 0 0 1 1 1 1 1
RESET I	RESET Indication	0 0 0 1 1 0 1 1
CLEAR C	CLEAR Confirm	0 0 0 1 0 1 1 1
CLEAR R	CLEAR Request	0 0 0 1 0 0 1 1
CALL AC	CALL ACcept	0 0 0 0 1 1 1 1
CALL RQ	CALL ReQuest	0 0 0 0 1 0 1 1
USE CTRL-ROLL TO START HERE		

Note 1: X = Don't Care. M is selected on the Trigger Conditions menu.

Note 2: For X.25 Modulo 128 Packet Type Identifiers of Information and Supervisory Packets, see Table 46-4.

TABLE 46-4
X.25 MODULO 128 SEQUENCED PACKET-TYPE SELECTIONS ON
TRIGGER CONDITIONS MENUS

TYPE Selection	Definition	Octet 3 Bit Pattern (1) 8 7 6 5 4 3 2 1	Octet 4 Bit Pattern 8 7 6 5 4 3 2 1
DATA	DATA	X X X X X X X 0	X X X X X X X M(2)
RR	Receiver Ready	0 0 0 0 0 0 0 1	X X X X X X X 0
RNR	Receiver Not Ready	0 0 0 0 0 1 0 1	X X X X X X X 0
REJ	REJect	0 0 0 0 1 0 0 1	X X X X X X X 0
SREJ	Selective REJect	0 0 0 0 1 1 0 1	X X X X X X X 0

Note 1: X = Don't Care.

Note 2: M is selected on the Trigger Conditions Menu.

47
BIT-ORIENTED PROTOCOLS: SPECIAL DISPLAYS

NOTE: The special mnemonic displays described here are intended for use only when BSC/X.25, 7E/X.25, SDLC, or SDLC/NRZI has been selected for FORMAT on the Parameter 1 menu.

NOTE: No CRT enhancements should be programmed on either triggers or the Parameter 2 menu when the automatic frame or packet locator or protocol trace displays are being used. This is because the automatic control byte locators use the automatic CRT enhancements in the three BOP modes for reference to find the control bytes. Also, because all leading bytes (Address, Control, Octets 1-3) must be in the display buffer for correct expansion, programming triggers to freeze and unfreeze data or suppressing data may result in incorrect frame and packet expansions.

47.1 AUTOMATIC FRAME AND PACKET LOCATORS

When the data display is manually frozen (CRT MAN FRZ key), the COMSTATE II logic can locate and analyze frames and packets automatically. If 7E/X.25 has been selected on the Parameter 1 menu, both frame and packet locators can be used. You may choose any frame or packet on the CRT screen and the COMSTATE II will automatically find the frame-control field or packet-type identifier and display a mnemonic expansion of it. The frame locator is also valid for SDLC and SDLC/NRZI. The mnemonics that may be displayed are given in Tables 45-1 and 45-3.

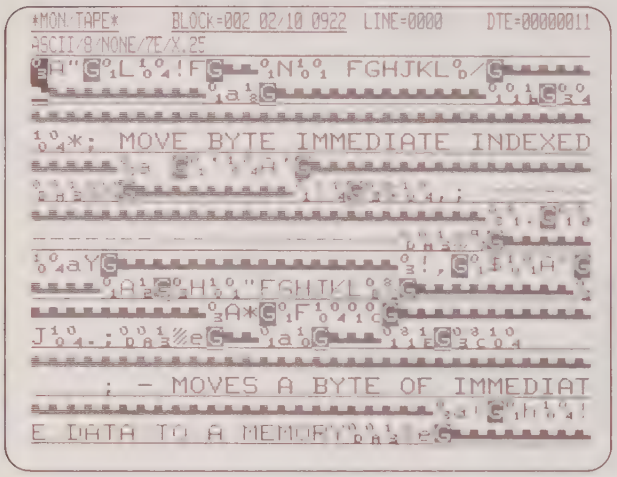


Figure 47-1

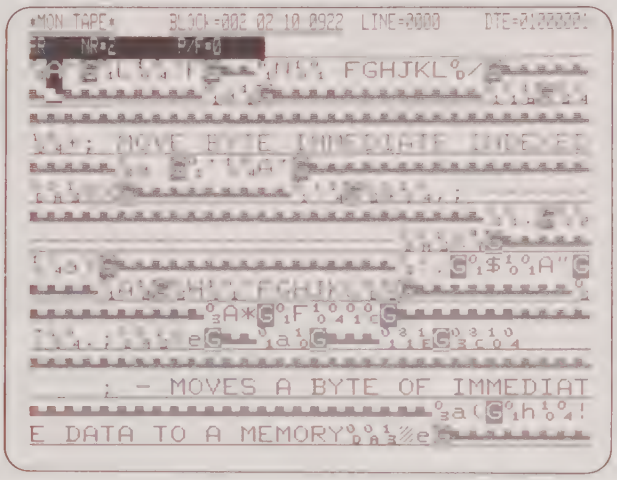


Figure 47-2

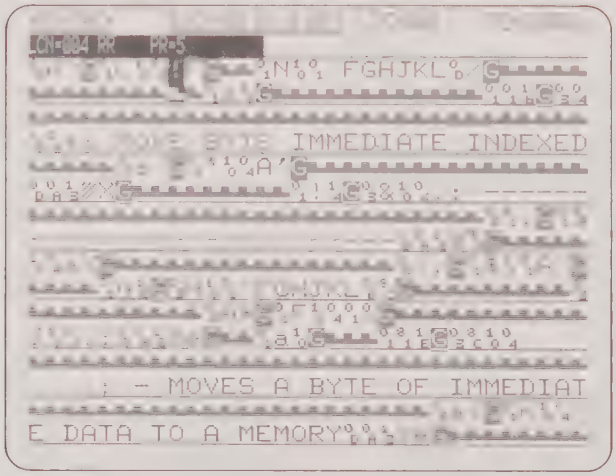


Figure 47-3

Frame and packet expansions can also be selected manually, as explained in Section 47.2.

With the data display manually frozen, press the B key to display the beginning of the CRT buffer. The cursor will be on the first data byte in the display (Figure 47-1). Then press the F key once to automatically tab the cursor to the next frame-control field (see Figure 47-2). The mnemonics for the control field type, the sequence number (or numbers), and the P/F bit value will be displayed on the second line. The binary breakdown of the control field at the cursor location will be displayed at the upper right.

Notice that the binary expansion is given with the first bit sent (low-order bit) at the far right and the highest-order bit to the left. In dealing with bit-oriented protocols it is important to remember that there are considerable discrepancies in the literature regarding the order in which the bits are presented on paper, as well as how they are numbered.

In dual-line display, of course, the frame-control field or packet-type identifier expansion only applies to one of the two cursor characters, but this is easily identified because the single binary breakdown at the upper right of the display is labeled as DTE or DCE. (See Figure 47-2.)

To find the next packet-type identifier (Octet 3), use the P key; the cursor will tab to the octet (Figure 47-3). On the second line will be displayed the logical channel number and the sequence count modulus (8 or 128). The packet sequence numbers, P(S) and P(R), will be given, and if the Q, D, or M bit is 1, the letter symbol will be displayed.

Within an information frame, alternate use of the F and P keys moves the cursor between the frame-control field and the packet-type identifier of that frame until one of the two keys is operated twice consecutively.

To return to any byte you have already seen, you may use the UP cursor arrow to reposition the cursor; then use the F or P key again.

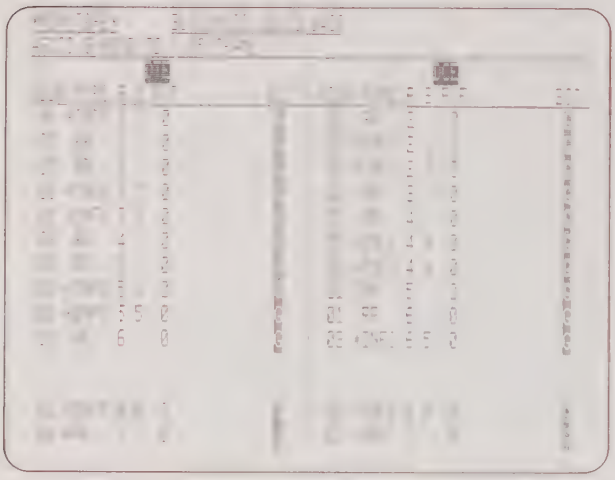


Figure 47-4

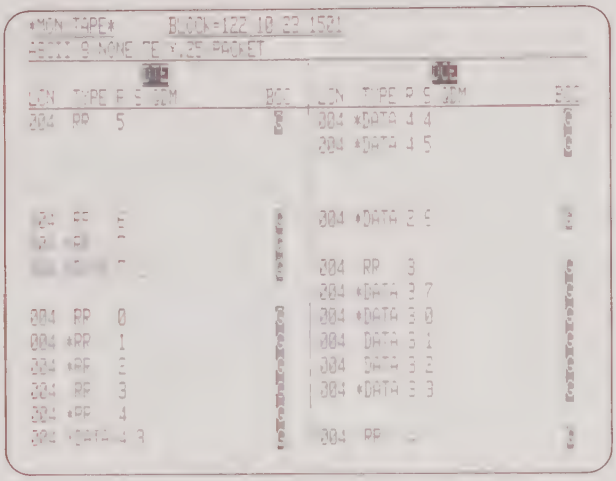


Figure 47-5

47.2 MANUAL FRAME AND PACKET EXPANSIONS

You may obtain a mnemonic expansion for any character on the frozen data screen by positioning the cursor at the desired byte with the cursor arrows; then pressing CONTROL-F or CONTROL-P. Remember, though, that in this case the logic cannot distinguish between a genuine frame-control field or packet-type identifier and any other data byte. It will try to expand whatever byte you select.

In dual-line mode, you may also select the lead to which you wish CONTROL-F or CONTROL-P to apply. Pressing T before CONTROL-F or P selects TD; R selects RD. Either lead selection remains in effect until you cancel it by selecting the other lead. The default lead selection, T, is restored by pressing the PROGRAM key.

47.3 PROTOCOL MNEMONIC TRACE DISPLAY

For 7E/X.25, BSC/X.25, and the SDLC formats, when X.25 FRAME, X.25 PACKET, or SDLC Trace is selected for Display Mode on the Parameter 2 CRT Control menu you will see a sequential display of only frame (level 2) or packet (level 3) protocol in Run Mode.

The trigger program will continue to run while the protocol trace is displayed. Counters and timers can still be read. However, no CRT enhancements other than Clear CRT and Freeze should be programmed and no data except for flags should be suppressed from the display buffer.

> NOTE: Trace Display is available for BSC/X.25 when transmissions adhere to bisync protocol. See Section 49.5 on using the COMSTATE II to transmit BSC/X.25 frames.

47.3.1 Display Description

For X.25 Frame, X.25 Packet, or SDLC Trace display, the protocol is presented in two columns (see Figures 47-4 and 47-5), with DTE protocol on the left and DCE on the right. As new data is received, it overwrites the old just as on the real-time data display. If multiple frames or packets are received on one side of the line, then spaces are inserted on the other side to maintain time correlation between TD and RD. If a frame or packet has been suppressed using the TYPE SELECT field (see Section 47.3.3), a space is shown in its place.

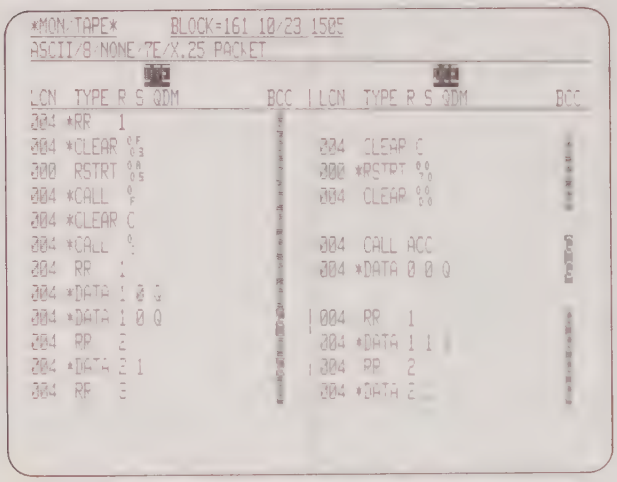


Figure 47-6

Figure 47-7

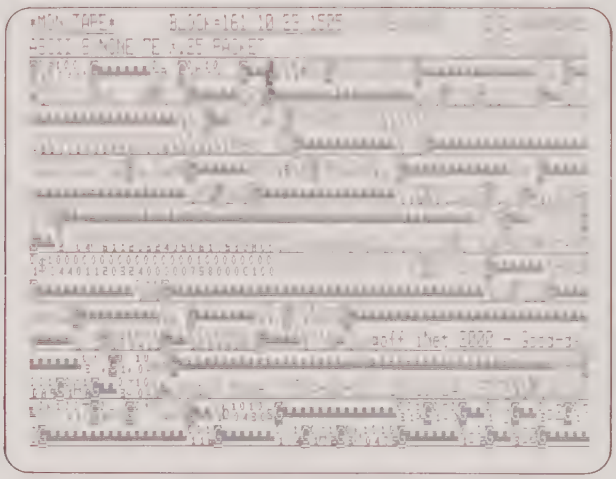


Figure 47-8

If two frames or packets are received at about the same time, they are displayed on the same line. An asterisk precedes the control-type mnemonic of the frame or packet that was received first.

The frame mnemonics displayed are listed in Table 45-1. Packet mnemonics are listed in Table 45-3. For either display, blocks will be identified as Good, Bad, or Aborted by reverse-image G, B, or A as on the data display.

In the frame trace display, the address, control type, N(R) and N(S) counts and P/F bit status are shown, and the frame check sequence is evaluated.

If you select X.25 PACKET TRACE on the Parameter 2 menu, the packet display will show LCN (logical channel number), packet type, and P(R) and P(S) counts. Q, D, and M will be displayed when they are ON.

In some nonsequenced packet types there are additional bytes of interest. In these cases, since there are no P(R) or P(S) counts, the space reserved on the CRT for P(R) and P(S) is used to display the additional causing characters in hexadecimal. For CALL and INTERRUPT packets, one additional byte is displayed (Octet 4 of the packet), and for CLEAR, RESET, RESTART, and DIAGNOSTIC packets, two extra bytes (Octets 4 and 5 of the packet; see Figure 47-6) are shown.

47.3.2 Manual Freeze

To analyze the trace display, freeze it with the CRT MAN FRZ key. A typical Manual Freeze display is shown in Figure 47-7. The line number displayed at the top is the number of the first line of data in the buffer for which protocol is analyzed on the trace display. To see protocol for the beginning of the data buffer, press the B key; for the end of the buffer, use the E key. You can scroll through the protocol buffer line by line with the Up or Down arrow.

To see data corresponding to the frozen protocol trace display press the DATA key (compare Figures 47-7 and 47-8). With data displayed, press the TRACE key to see the corresponding level-2 trace (SDLC or X.25 FRAME TRACE). Press TRACE again to see the corresponding level-3 trace (SNA or X.25 PACKET TRACE).

To find a specific frame or packet on the data display, first scroll the line of the trace display in which you are interested to the top of the display. Note the buffer line number before you go to the data display. Once you have changed the display, the cursor will be located at the beginning of the first frame received on that line (the frame preceded by an asterisk on the protocol trace display). You can use the frame or packet locator (F or P key; Section 47.1) to identify the specific frame or packet.

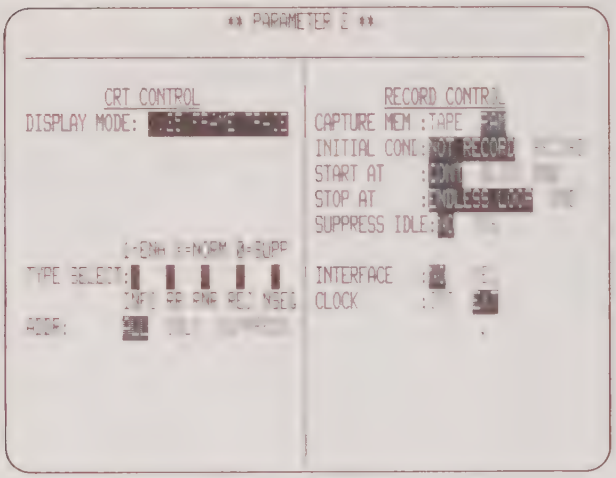


Figure 47-9

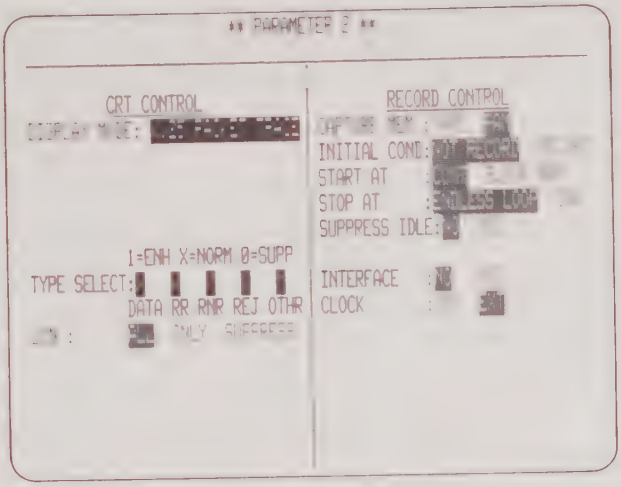


Figure 47-10

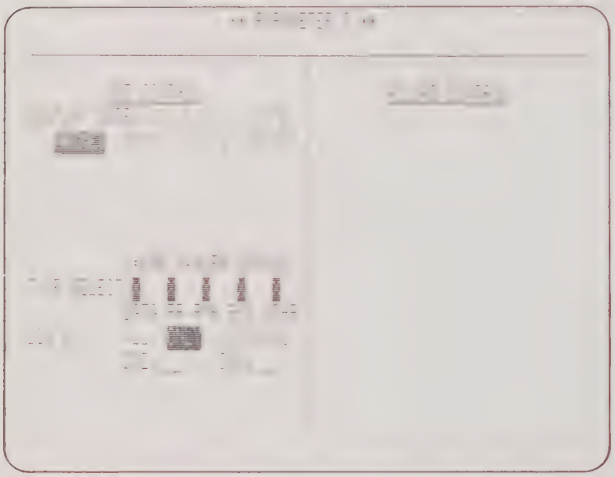


Figure 47-11

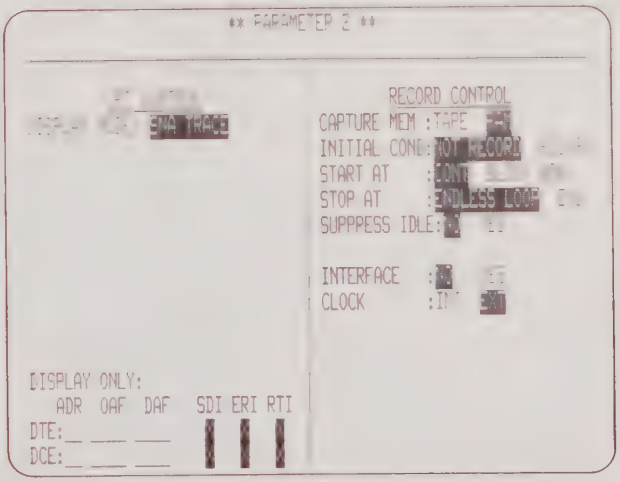


Figure 47-12

47.3.3 Display Control and Highlights

When X.25 FRAME, X.25 PACKET, or SDLC Trace is selected on the Parameter 2 menu, the SUPPRESS and ENHANCE fields disappear and two new fields are shown.

(a) Type Select. This is a data-entry field that appears upon selection of X.25 FRAME, X.25 PACKET, or SDLC Trace. If X.25 FRAME or SDLC Trace is selected (Figure 47-9), this field includes INFO, RR, RNR, REJ, and NSEQ. If X.25 PACKET Trace is selected (Figure 47-10), the list will be DATA, RR, RNR, REJ, and OTHER.

The default condition is normal (X) video display of the expansions of the five selections. Enter 1's to display the selected frame or packet expansions in low-intensity reverse image. Enter 0's to suppress display of any selections.

(b) Addr/LCN. This selection also appears when X.25 FRAME Trace (Figure 47-9), SDLC Trace, or X.25 PACKET Trace (Figure 47-10) is selected in the DISPLAY MODE field. There are two fields for this selection. The first line is a data selection field. For the default selection ALL, mnemonic expansions for all traffic are displayed. If you select ONLY, only the traffic for the address or LCN entered on the next line (Figure 47-11) will be displayed. SUPPRESS prevents display of the expansions for the address or LCN entered on the next line.

On the next line, you may select either DTE or DCE or both by entering the address(es) or LCN number(s) in which you are interested. If you have selected X.25 FRAME or SDLC Trace on the DISPLAY MODE line above, enter the frame level address in the DTE or DCE entry field or in both. (Enter two hexadecimal characters per byte. Do not use the HEX key. See Section 49.14 for more information on frame addresses.) If you have selected X.25 PACKET Trace, enter a three-digit hexadecimal logical channel number, in the DTE or DCE entry field or in both.

(c) SNA Trace Display Fields. When SNA Trace is the selected display mode, a new group of DISPLAY ONLY selections appear at the bottom of the Parameter 2 screen (see Figure 47-12). These selections are explained in Section 48.1.

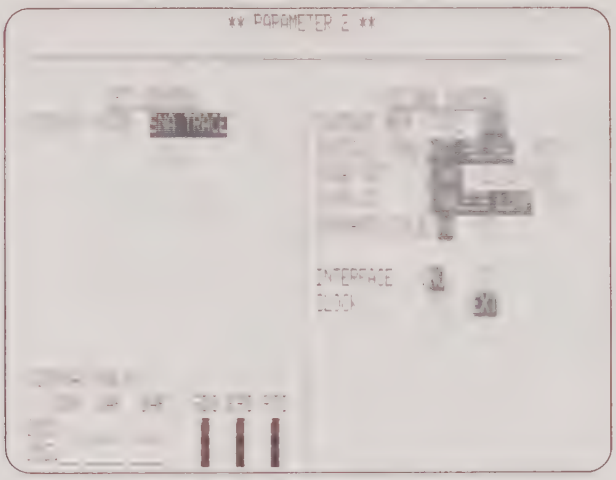


Figure 48-1

48
BIT-ORIENTED PROTOCOLS: THE SNA TRACE DISPLAY

When Option 07 is installed in the COMSTATE II, SNA Trace is available as a display mode on the Parameter 2 menu. This mode is intended for use with SDLC or SDLC/NRZI selected as the FORMAT on the Parameter 1 menu. SNA Trace provides a real-time expansion of SNA frames. As with other display modes, trigger programs are active while the trace is displayed, and counters and timers can be read.

By default, all frames are analyzed and displayed in SNA Trace mode; however, Parameter 2 selections allow you to restrict display to certain frames.

48.1 DISPLAY ONLY ENTRIES (PARAMETER 2)

DISPLAY ONLY selections appear at the bottom of the Parameter 2 screen when SNA Trace is the Display Mode. These selections allow you to specify which DTE or DCE frames will be displayed (see Figure 48-1.)

There are two fields for both DTE and DCE data: an address selection field and an indicator field. The address selection field allows three operator entries: ADR (frame address), OAF (originating address field), and DAF (destination address field). The indicator field contains three highlighted boxes for SDI (Sense Data Included Indicator), ERI (Exception Response Indicator), and RTI (Response Type Indicator) entries.

48.1.1 Address Selection Entries

Address selection entries allow the user to display data selectively for a specific controller or device.

In SDLC/SNA protocol, the SDLC frame address (ADR) usually applies to the device controller.

Two additional fields are included in the SNA Transmission Header: DAF (Destination Address Field) and OAF (Originating Address Field). (See Section 48.4.2 for a description of the Transmission Header.) OAF and DAF addresses apply to the individual devices attached to a controller.

If no address selection entries are made, the COMSTATE II will display frames with any address combination.

If you enter a specific frame address on the DTE line below ADR, the COMSTATE II will only display DTE frames which contain that frame address. All frames on the DCE side will be displayed, unless you also make an ADR entry for the DCE on the Parameter 2 menu. Enter two characters on the line below ADR to represent one hexadecimal byte (the most significant digit goes on the left).

To display data only to or from a specific device, you may enter up to four characters on the lines provided below OAF and DAF. (An entry below OAF controls display of data from the device; an entry below DAF controls display of data to the device.) Each two characters you enter represent the hexadecimal value of one byte. In the actual Transmission Header, the OAF and DAF may each be one to two bytes in length, depending on the FID type.

You may make entries for any or all of the address items shown on the Parameter 2 menu. However, if more than one entry is made on the same line (DTE or DCE), display of frames is restricted further. For example, if you specify an ADR and an OAF on the DTE line, then only DTE frames with the frame address and Originating Address Field indicated will be displayed. If you do not specify a DAF, however, displayed frames may contain any DAF value.

You may limit display even more, if you wish, by designating a value for one or more of the indicators.

48.1.2 The Indicator Field (SDI, ERI, and RTI)

The indicator field may be used in conjunction with, or independently from, the address selection field.

SDI, ERI, and RTI values may be indicated for either DTE or DCE data or both. "X" represents "Don't Care"; that is, "0 or 1." To specify the desired value of any of these indicators, type 0 or 1 over the X.

NOTE: The CLEAR FIELD key may be used to clear entries from the indicator fields or the address selection field. When used to clear an indicator value, the key returns all three values on the line to X, no matter which box the cursor is located in.

Indicator entries operate differently from address selection entries. (In Boolean terms, the indicator entries are "ORed," while the address selections are "ANDed.") Entering one indicator value restricts display to Information frames which contain that indicator and that value. If, for example, you type a "1" under RTI on the DCE line, response frames with the RTI set to 1 -- and only those frames -- will be displayed. (The entry does not influence DTE display in this case.) However, if you type in values for other indicators on the DCE line, then DCE frames with any of the specified values will be displayed.

See Section 48.4.3 for further discussion of these three indicators and their values.

NOTE: Any address selections dictate in which frames these indicator values will be sought and displayed.

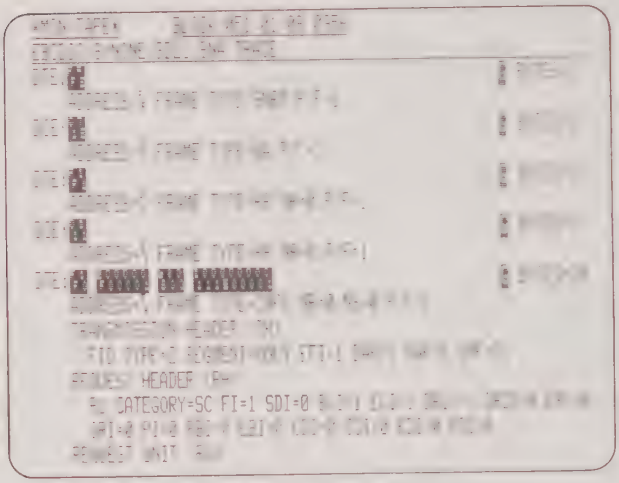


Figure 48-2

Figure 48-3

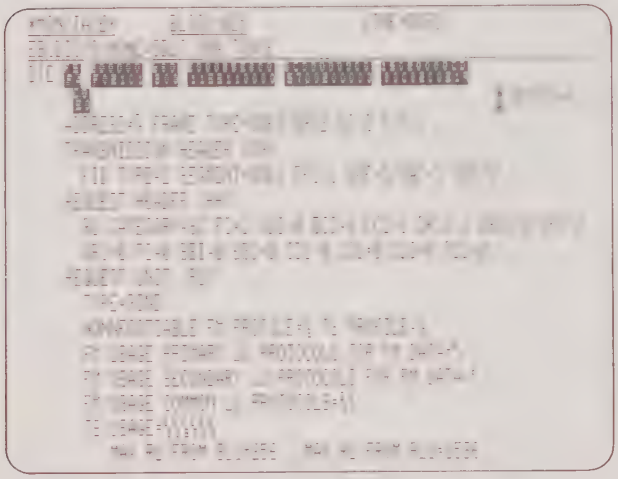


Figure 48-4

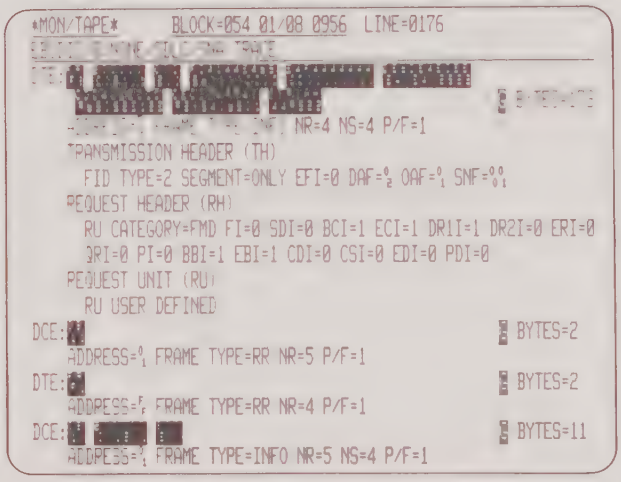


Figure 48-5

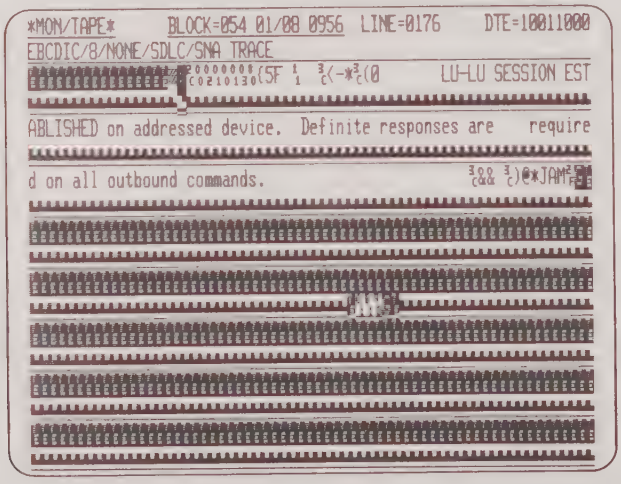

MON/TAPE BLOCK=054 01/08 0956 LINE=0176 DTE=10011000
EBCDIC/8/NONE/SDLC/SNA TRACE
LU-LU SESSION EST
ABLISHED on addressed device. Definite responses are require
d on all outbound commands.

Figure 48-6

48.2 DESCRIPTION OF DISPLAY

When data is analyzed using SNA Trace, the real-time display will resemble Figures 48-2 through 48-4. Textual information about each frame is displayed in blocks of variable size. A line across the screen demarcates the end of each expanded frame.

See Appendix L for abbreviations commonly used in the SNA Trace, along with their meanings.

NOTE: The most recently received frame always appears above the line.

On the initial line in each frame expansion, the source of the frame (DTE or DCE) is identified. To the right, the first 67 bytes contained in the frame are displayed as hexadecimal values in highlighted segments. (FCS bytes are not displayed.) The results of the block check are displayed as a low- or high-intensity character after the frame. As on other displays, G indicates a good block check, B indicates a bad block check, and A indicates an aborted frame.

The total byte count of the frame is given following the block check character. This total does not include opening and closing flags or FCS bytes.

NOTE: The maximum number of bytes displayed in hexadecimal form for each frame is 67. This is the length of the longest expected block of header information in any SDLC-SNA frame. In frames with less header information, user data may be appended to the hexadecimal display at the end of the RU. The display does not intend to show all user data, however, and, as a result, the total number of bytes listed for a frame may be greater than the number of bytes displayed.

To view user data which is not shown as part of the raw data on the SNA trace, freeze the screen and use the DATA key to display the corresponding line data (see Figures 48-5 and 48-6).

The highlighted frame segments are analyzed in successive lines. In every identifiable frame, frame address and control byte are displayed in the first segment. The segment is expanded on the first line below the highlighted frame. In addition to the frame address, frame type, frame sequence (NR and NS) if present, and status of the poll/final (P/F) bit are given. When a frame cannot be analyzed, the message "INCOMPLETE FRAME" will appear on this line. This indicates that the actual contents of the frame are inconsistent with the frame's control information.

The empty space between two segments indicates the start of another major field; that is, the Transmission Header (TH), Request/Response Header (RH), or the Request/Response Unit (RU). Whenever a field extends beyond ten bytes, it is segmented and separated by a vertical bar from the preceding bytes in the same field (see Figure 48-5).

The expansion beneath the highlighted frame is arranged to make referencing frame values easier. Each major field begins on a new line, flush left with the frame. Any additional lines including data for that field are indented. In Figure 48-5, for example, FID TYPE is contained in the Transmission Header field. The display indicates that the TH is the second major field, represented in the second highlighted segment of raw data, above.

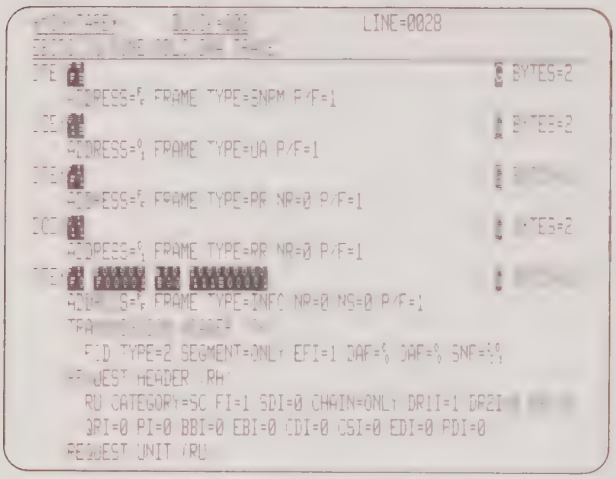

LINE=0028
BYTES=2
ADDRESS=F4 FRAME TYPE=SNRM P/F=1
ADDRESS=03 FRAME TYPE=UA P/F=1
ADDRESS=F4 FRAME TYPE=RR NR=0 P/F=1
ADDRESS=03 FRAME TYPE=RR NR=0 P/F=1
FRAME TYPE=INFO NR=0 NS=0 P/F=1
FID TYPE=2 SEGMENT=ONLY EFI=1 DAF=03 OAF=03 SNF=01
REQUEST HEADER (RH)
RU CATEGORY=SC FI=1 SDI=0 CHAIN=ONLY DRII=1
DRI=0 PI=0 BBI=0 EBI=0 CDI=0 CSI=0 EDI=0 FDI=0
REQUEST UNIT (RU)

Figure 48-7

Figure 48-8

48.3 CONTROL OF THE DISPLAY

The SNA Trace Mode can be controlled like any other trace mode:

- The CRT MAN FRZ and UNFRZ keys can be used to stop the screen in Run Mode.
- Up and down cursor arrows allow you to move through the display when it is frozen. The Control key and Up arrow pressed simultaneously move the cursor up one screen at a time; Control and Down arrow move it down one screen at a time.
- B and E keys move the cursor to the beginning or end of the buffer when the display is frozen.
- The DATA key is available to display the actual line data (in dual-line mode) for comparison to the SNA expansion.
- The TRACE key alternates between the SNA Trace and the SDLC (Level-2 frame mnemonic) Trace. This allows you to move from an indepth expansion of one frame to a summary of SDLC frame exchanges. (See Figures 48-7 and 48-8.)
- When the screen is frozen and data corresponding to the SNA trace is displayed, the F key can be used to obtain an expansion of the SDLC frame control byte.

NOTE: The P key should be used for level-3 (packet) expansion only with X.25 data.

For additional information on the use of these keys, refer to Section 47.

48.4 SNA FRAME STRUCTURE

The SNA trace divides each frame into five major fields which correspond to the actual structure of the frame. These fields, the link header, transmission header, request/response header, request/response unit, and the link trailer, are discussed in the following paragraphs.

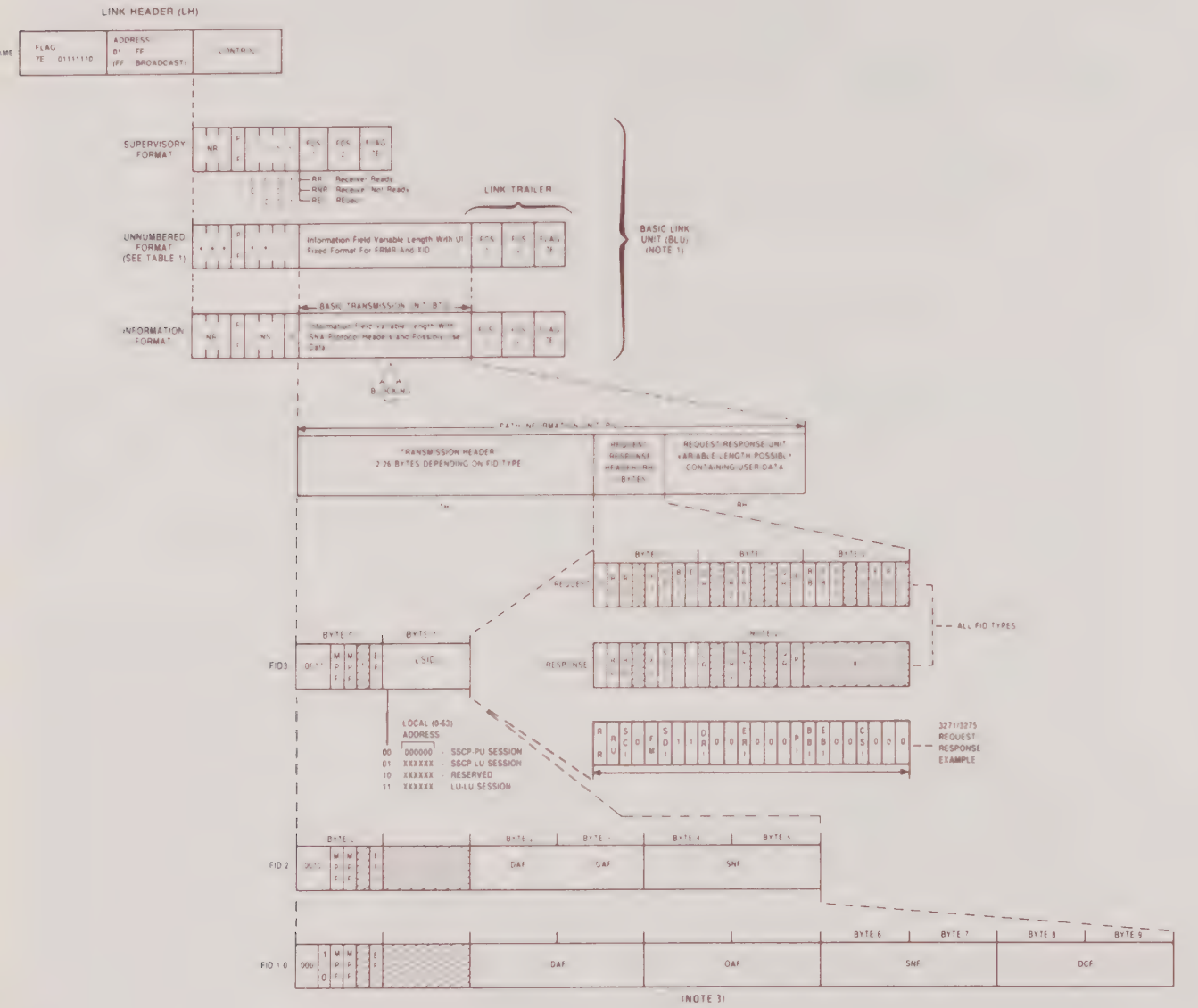
48.4.1 The Link Header

The link header consists of three bytes: the initial 7E flag, the frame address byte, and the control byte. The link header corresponds to the first two-byte segment of raw data in an SNA frame trace (see Figure 48-7). (The initial flag is not displayed.)

The control byte indicates the frame type, which dictates the structure of the remainder of the frame. This byte also contains the poll/final (P/F) bit, whose status is shown in the first line of text in the SNA trace. In Information frames, sequence numbers (NR and NS) are included in the control byte. Their values appear on the first line of text in the SNA trace, when they are present in the frame. (The same sequence numbers appear at the top of the screen when the F key is used to obtain frame expansions on the frozen SDLC data display.)

If the frame is a Supervisory frame, it contains only these three bytes and the link trailer. FRMR and XID frames are slightly longer but have fixed formats. Other Unnumbered frames and Information frames vary in length.

See Table 48-1 for a list of frames and their control byte values. See Figure 48-9 for a comparison of the different frame structures.



NOTES

1 RIGHT MOST BIT TRANSMITTED FIRST OF EACH BYTE ALL DATA SHOWN AS DISPLAYED ON INTERVIEW PROTOCOL ANALYZERS

2 3270 ENTRIES BCI=1 ECI=1, DR2=0 DR1=0, ED1=0, PDI=0

3 SEE TABLE 48-3 FOR FID 4,F TH FORMAT

* UNDEFINED OR VARIABLE

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Figure 48-9 SDLC/SNA General Frame Format

48.4.2 The Transmission Header (TH)

The second major field in the trace is the Transmission Header (TH), which corresponds to the second independent segment of raw data in the SNA trace display (see Figure 48-7). Only Information frames contain this and successive major fields.

The length of the Transmission Header depends on the Format Identifier (FID) type. The FID is always specified in this field and expanded in the trace. The length of the TH for FID 0 and FID 1 is 10 bytes. The TH length for FID 2 is 6 bytes. For FID 3, it is 2 bytes; for FID 4 and FID F, it is 26 bytes.

Figure 48-9 shows the format of the Transmission Header for FID types 0-3; Figure 48-10 shows the format for FID types 4 and F. For TH Field Definitions, refer to Tables 48-2 (FID types 0-3) and 48-3 (FID types 4 and F). FID types used by different physical units are listed in Table 48-4.

48.4.3 The Request/Response Header (RH)

This is the third major field in an SDLC-SNA Information frame. It corresponds to the third independent segment in the raw data portion of the SNA trace (see Figure 48-7).

The RH can be either a Request or a Response Header. The content of a Request Header differs from the content of a Response Header. (Format differences for the two are shown in Figure 48-9.) The RH, which is present only in Information frames, immediately follows the Transmission Header. The length of the RH is always three bytes, and the request and response formats are the same for all FID types. Refer to Table 48-5 for Request/Response Header Field Definitions.

The three indicators which can be specified on the Parameter 2 menu (see Section 48.1) are located in the RH.

> NOTE: These selections on the Parameter 2 menu affect display of frames being received or sent; they do not influence interactive testing in any way.

The first, SDI (the "Sense Data Included" indicator), is one bit in length. If set to 1, sense data will be included in the Response Unit. Refer to Figure 48-9 for the location of the SDI. The value of the SDI is given in the RH section of the SNA Trace display. The resultant structure of the RU is discussed in Section 48.4.4.

The ERI (Exception Response Indicator), the second selectable indicator on the Parameter 2 menu, is a three-bit field also located in the RH of a request. The ERI when set indicates that the requestor wants to receive only exception responses; that is, responses which signal an error condition. When set to 0, the ERI is interpreted in conjunction with the DR1I and DR2I indicators to determine whether the requestor wants to receive definite responses or no responses. Refer to Table 48-5 for the combined values which define the type of response requested. The settings of ERI, DR1I, and DR2I are shown in the RH section of the SNA Trace display.

RTI (the Response Type Indicator), is present only in the RH of a response. When set to 1, it indicates that the frame containing it is a negative response; that is, that the request cannot be accepted by the intended recipient. Refer to Figure 48-9 for its location in the RH.

Note :

1. X'01'=T6 SNF
Wrap Acknowledgment
(Only Value Defined)

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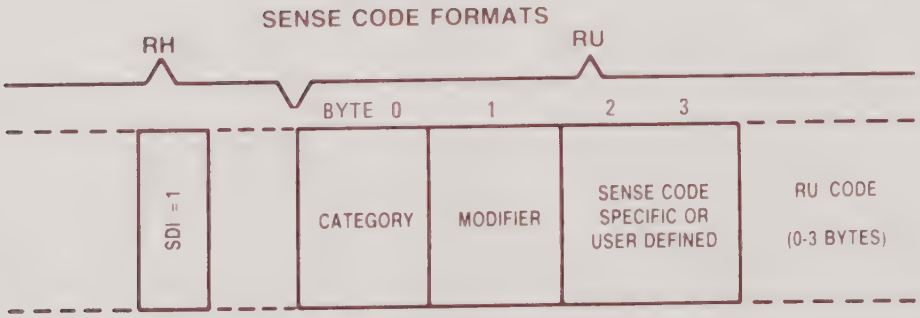
Figure 48-10 Transmission Header Format
for FID Types 4, F.



CATEGORY	VALUE
USER SENSE DATA ONLY	X 00
REQUEST REJECT	X 08
REQUEST ERROR	X 10
STATE ERROR	X 20
RH USAGE ERROR	X 40
PATH ERROR	X 80

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Figure 48-11 Sense Data Format

48.4.4 The Request/Response Unit (RU)

This is the fourth major field in an SDLC-SNA Information frame. It corresponds to the fourth independent segment in the raw data portion of the SNA trace (see Figure 48-7).

The RU is present only after a Request/Response Header; that is, in Information frames. It varies in length and may contain user data. The label "USER DEFINED" is listed as the only line of the RU expansion if the RU is not SNA-defined. Table 48-6 contains an index of Request/Response Units by Network Service header and request code.

When the SDI indicator in the RH is set to 1, the RU contains sense data. As illustrated in Figure 48-11, the RU in this case begins with four bytes which define a Category, a Modifier, and a Sense Code for the data. This sense data is displayed, when present, in the SNA trace (see Figure 48-12.) The hexadecimal value of the four bytes appears in the RU expansion field after the label Sense Data. The meaning of the Category byte is listed on the next line. The modifier byte, then two bytes of additional sense information are isolated on the following two lines. Modifier bytes for each category are defined in Table 48-7.

48.4.5 The Link Trailer

The Link Trailer (LT) consists of the final three bytes of the frame: two Frame Check Sequence (FCS) bytes and a closing flag. The Link Trailer is present at the end of every SDLC-SNA frame (see Figure 48-9).

While the Link Trailer is not displayed as part of the raw data in the SNA trace, the results of the frame check are displayed as a low intensity G (good frame) or high intensity B (bad frame) or A (aborted frame) immediately following the segmented data.

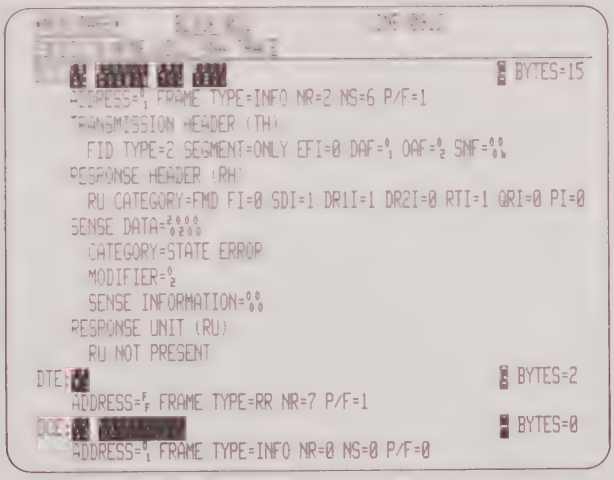

Figure 48-12

48.5 INTERPRETING SNA TRACE IN CONTEXT

The COMSTATE II SNA Trace is an in-depth analysis of standard SDLC-SNA protocol. In some cases, however, the COMSTATE II may not define the data in a manner which is consistent with a specific implementation. For example:

(1) If FI=0 for RU category 01, 10, or 11, the COMSTATE II will display an RU type, although an FI set to zero is invalid.

(2) If too many bytes are contained in the RU type field, the COMSTATE II will interpret only the data which falls within the correct length.

(3) The COMSTATE II does not distinguish between Network Services (SSCP-based sess'ons) and Presentation Services (LU-LU Sessions). COMSTATE II will interpret data as Network Services data.

TABLE 48-1
SNA FRAME TYPES

FORMAT	MNEMONIC	ACRO-NYM	FUNCTION (NOTE 3)	BINARY EXPANSION	HEX NOTATION P/F = 0	HEX NOTATION P/F = 1	
UNNUMBERED FORMAT	UNNUMBERED INFORMATION	UI	C/R	000 P/F 0011	03	13	VARIABLE LENGTH INFORMATION FIELD
	REQUEST INITIALIZATION MODE	RIM	R	000 P/F 0111	07	17	
	SET INITIALIZATION MODE	SIM	C	000 P/F 0111	07	17	
	DISCONNECT MODE	DM	R	000 P/F 1111	0F	1F	
	UNNUMBERED POLL	UP	C	001 P/F 0011	23	33	
	REQUEST DISCONNECT	RD	R	010 P/F 0011	43	53	
	DISCONNECT	DISC	C	010 P/F 0011	43	53	
	UNNUMBERED ACKNOWLEDGMENT	UA	R	011 P/F 0011	63	73	
	SET NORMAL RESPONSE MODE	SNRM	C	100 P/F 0011	83	93	
	FRAME REJECT	FRMR	R	100 P/F 0111	87	97	SEE FRMR FORMAT (BELOW)
	EXCHANGE IDENTIFICATION	XID	C/R	101 P/F 1111	AF	BF	SEE XID FORMAT 0 (BELOW)
	CONFIGURE	CFGR	C/R	110 P/F 0111	C7	D7	
	TEST	TEST	C/R	111 P/F 0011	E3	F3	VARIABLE LENGTH INFORMATION FIELD
	BEACON	BCN	R	111 P/F 1111	FF	FF	
	LPDA REQUEST RESULT	LPDA	C/R	111 P/F 1011	EB	FB	
SUPERVISORY FORMAT	RECEIVE READY	RR	C/R	nnn P/F 0001	x1	x1	
	RECEIVE NOT READY	RNR	R	nnn P/F 0101	x5	x5	
	REJECT	REJ	C/R	nnn P/F 1001	x9	x9	
INFORMATION TRANSFER FORMAT	NUMBERED INFORMATION PRESENT		C/R	nnn P/F nnn0	xx	xx	

EXTENDED FORMAT C F

NR	P/F	NS	0			INFORMATION
NR	P/F	XXXX 0000	SS	01		SUPERVISORY
0000000	P/F	MMM	•	MM	11	UNNUMBERED

S Supervisory Function Bits
M Modifier Function Bits

FRMR FORMAT

		CONTROL	BYTE 0	BYTE 1				BYTE 2	
FLAG	ADDRESS	100 F 0111	C FIELD	NR	0	NS	0	0 0 0 0	Z Y X W

REJECTED C FIELD — THIS STATION S PRESENT NR — NS COUNT S

Received NR is incongruous
Buffer overrun I Field too long
Prohibited I Field
Invalid or non-implemented command

48 BIT FIELD
XID FORMAT 0

		CONTROL	BYTE 0		BYTE 1	BYTE 2	BYTES 3-5
F	A	101 P F 1111	ID FORMAT (4)	PU TYPE (4)	SELF DESCRIPTION	DEVICE TYPE (12)	TERMINAL IDENTIFICATION (20)

TABLE 48-2
FID 0-3 TH DEFINITIONS

ACRONYM	MNEMONIC	DEFINITION
MPF	MAPPING FIELD	00 = MIDDLE 01 = LAST 10 = FIRST 11 = ONLY
EFI	EXPEDITED FLOW INDICATOR	0 = NORMAL 1 = EXPEDITED
DAF	DESTINATION ADDRESS FIELD	SNA NETWORK ADDRESS OF DESTINATION NAU
OAF	ORIGIN ADDRESS FIELD	SNA NETWORK ADDRESS OF ORIGIN NAU
SNF	SEQUENCE NUMBER FIELD	SNA BIU NUMBER OR ID FOR EXPEDITED FLOW
DCF	DATA COUNT FIELD	NUMBER OF BYTES IN BIU OR BIU SEGMENT
LSID	LOCAL SESSION IDENTIFICATION	

TABLE 48-3
FID 4, F TH FIELD DEFINITIONS

BYTE	ACRONYM	MNEMONIC	DEFINITION	
0	TGSI	TRANSITION GROUP SWEEP INDICATOR	1 = PIU ORDER MAINTAINED IN TG	
	EVSI	ER & VR SUPPORT INDICATOR	1 = 1 OR MORE NODES DOES NOT SUPPORT ER, VR	
	VPCI	VIRTUAL ROUTE PACING COUNT	0 = VR PACING COUNT ≠ 0	
	NP	NETWORK PRIORITY	1 = PIU FLOWS AT NETWORK PRIORITY, NOT TPF (BYTE 3)	
2	IERN	INITIAL EXPLICIT ROUTE NUMBER	SAME AS VRN (BYTE 3)	
	ERN	EXPLICIT ROUTE NUMBER	IN DIRECTION OF PIU FLOW	
3	VRN	VIRTUAL ROUTE NUMBER		VRID
	TPF	TRANSMISSION PRIORITY FIELD	00 = LOW, 01 = MEDIUM, 10 = HIGH	
4	VCWI	VR CHANGE WINDOW INDICATOR	0 = INCREMENT 1 = DECREMENT	
	TGNFI	TG NON-FIFO INDICATOR	0 = TG FIFO REQUIRED	
	VSTI	VR SEQUENCE & TYPE INDICATOR	00 = NON-SEQ, NON-SUPV 01 = NON-SEQ, SUPV 10 = SINGLY SEQ	
4 & 5	TGSNF	TG SEQUENCE NUMBER FIELD	USED WHEN TGNFI = 0	
6	VRPRQ	VR PACING REQUEST	1 = VR PACING RESPONSE REQUESTED	
	VRPRS	VR PACING RESPONSE	1 = VR PACING RESPONSE SENT IN RESPONSE TO VRPRQ = 1	
	VCWRI	VR CHANGE WINDOW REPLY INDICATOR	WHEN VRPRS = 1, 0 = INCREMENT, 1 = DECREMENT	
	VRWI	VR RESET WINDOW INDICATOR	0 = DO NOT RESET, 1 = RESET TO MINIMUM SIZE	
6 & 7	VRSSNF	VR SEND SEQUENCE NUMBER FIELD	PIU SEQUENCING FOR VSTI = 10 (BYTE 4)	
8-11	DSAF	DESTINATION SUBAREA ADDRESS FIELD	WITH VRN (BYTE 3), IDENTIFIES VR	
12-15	OSAF	ORIGIN SUBAREA ADDRESS FIELD		

(continued)

TABLE 48-3 (continued)

BYTE	ACRONYM	MNEMONIC	DEFINITION
16	SNAI	SNA INDICATOR	0 = DESTINATION IS NON-SNA DEVICE, CONVERT TO FIDO
	MPF	MAPPING FIELD	00 = MIDDLE, 01 = LAST, 10 = FIRST, 11 = ONLY SEGMENT
	EFI	EXPEDITED FLOW INDICATOR	0 = NORMAL, 1 = EXPEDITED
18-19	DEF	DESTINATION ELEMENT FIELD	DSAF + DEF = DESTINATION NETWORK ADDRESS
20-21	OEF	ORIGIN ELEMENT FIELD	OSAF + OEF = ORIGIN NETWORK ADDRESS
22-23	SNF	SEQUENCE NUMBER FIELD	BIU SEQUENCE NUMBER, SEGMENTS HAVE SAME SNF
24-25	DCF	DATA COUNT FIELD	BIU OR BIU SEGMENT LENGTH FOR PIU BLOCKING

TABLE 48-4

PHYSICAL UNIT TYPES	FID TYPE USED
PU.T1 = TERMINALS	FID 3
PU.T2 = CLUSTER CONTROLLERS	FID 2
PU.T4 = COMMUNICATIONS CONTROLLERS	FID 0, 1, 4, F
PU.T5 = HOST PROCESSORS	FID 0, 1, 4, F

TABLE 48-5
RH-FIELD DEFINITIONS

BYTE	ACRONYM	NAME	DEFINITION
0	-	RU Category (Including SCI)	00 = Function Management Data (FMD) 01 = Network Control (NC) 10 = Data Flow Control (DFC) 11 = Session Control (SC)
	FI	Format Indicator	RU = 00, LU-LU, 1 = FM Header follows SSCP: 1 = Field formatted (FF) 0 = Character coded RU ≠ 00, FI = 1
	SDI	Sense Data Indicator	1 = sense data included
	BCI	Begin Chain Indicator	00 = middle RU 01 = last RU
	ECI	End Chain Indicator	10 = first RU 11 = only RU in chain
1	DR1I	Definite Resp 1 Indicator	(DR1, DR2, ERI) = (1,0,0), (0,1,0), (1,1,0) = definite response
	DR2I	Definite Resp 2 Indicator	(0,0,0) = no response
	ERI	Exception Resp Indicator	(1,0,1), (0,1,1), (1,1,1) = exception response
	RTI	Response Type Indicator	1 = negative response
	QRI	Queued Response Indicator	0 = bypass TC queues
	PI	Pacing Indicator	1 = pacing request/response
2	BBI	Begin Bracket Indicator	1 = begin bracket
	EBI	End Bracket Indicator	1 = end bracket
	CDI	Change Direction Indicator	1 = begin bracket
	CSI	Code Selection Indicator	0 = Code 0 1 = Code 1
	EDI	Enciphered Data Indicator	1 = RU is enciphered
	PDI	Padded Data Indicator	1 = RU padded before encipherment

TABLE 48-6
INDEX OF RU'S BY NS
HEADERS AND REQUEST CODES
FMD NS HEADERS

(N) = Normal (E) = Expedited (DFC) = Data Flow Control (S) = Session Services
(SC) = Session Control (NC) = Network Control (C) = Configuration Services
(MA) = Maintenance Services (ME) = Measurement Services (MN) = Management Services

HEX	ACRONYM	HEX	ACRONYM
Byte 0*	(Byte 2 is request code)	Byte 0*	(Byte 2 is request code)
010201	N CONTACT (C)	010216	N ACTCONNIN (C)
010202	N DISCONTACT (C)	010217	N DACTCONNIN (C)
010203	N IPLINIT (C)	010218	N ABCONNOUT (C)
010204	N IPLTEXT (C)	010219	N ANA (C)
010205	N IPLFINAL (C)	01021A	N FNA (C)
010206	N DUMPINIT (C)	01021B	N REQDISCONT (C)
010207	N DUMPTEXT (C)	010280	N CONTACTED (C)
010208	N DUMPFINAL (C)	010281	N INOP (C)
010209	N RPO (C)	010284	N REQCONT (C)
01020A	N ACTLINK (C)	010285	N NS-LSA (C)
01020B	N DACTLINK (C)	010301	N EXECTEST (MA)
+01020C	N CESLOW (C)	010302	N ACTTRACE (MA)
+01020D	N CEXLOW (C)	010303	N DACTTRACE (MA)
01020E	N CONNOUT (C)	010311	N SETCV (MA)
01020F	N ABCONN (C)	010331	N DISPSTOR (MA)
010211	N SETCV (C)	010334	N RECSTOR (MA)
010214	N ESLOW (C)	010380	N REQTEST (MA)
010215	N EXSLOW (C)	010381	N RECMS (MA)

(continued)

* Request Code
+ Not in current list of supported requests

TABLE 48-6 (continued)

HEX	ACRONYM	HEX	ACRONYM
Byte 0*		Byte 0*	
010382	N RECTD (MA)	410245	N NS-IPL-FINAL (C)
010383	N RECTRD (MA)	410246	N NS-IPL-ABORT (C)
+010401	N STARTMEAS (ME)	+410285	N NSLSA (C)
+010402	N STOPMEAS (ME)	410286	N REQFNA (C)
+010480	N RECMD (ME)	410287	N LCP (C)
010604	N NSPE (S)	410304	N REQMS (MA)
010681	N INIT-SELF (Format 0) (S)	410305	N TESTMODE (MA)
010683	N TERM-SELF (Format 0) (S)	410306	N ROUTE-TEST (MA)
410210	N RNAA (C)	410384	N RECFMS (MA)
41021C	N DELETENR (C)	410385	N RECTR (MA)
41021D	N ER-INOP (C)	410386	N ER-TESTED (MA)
41021E	N ADDLINK (C)	41038D	N NMVT (MA)
410221	N ADDLINKSTA (C)	810387	N REQECHO (MA)
+410222	N ISETCV (C)	810389	N ECHOTEST (MA)
410223	N VR-INOP (C)	810601	N CINIT (S)
410235	N INITPROC (C)	810602	N CTERM (S)
410236	N PROCSTAT (C)	810620	N NOTIFY (SSCP-- LU) (S)
410237	N LOREQD (C)	810629	N CLEANUP (S)
410240	N REQACTLU (C)	810680	N INIT-OTHER (S)
410243	N NS-IPL-INIT (C)	810681	N INIT-SELF (Format 1) (S)
410244	N NS-IPL-TEXT (C)	810682	N TERM-OTHER (S)

(continued)

* Request Code
+ Not in current list of supported requests

TABLE 48-6 (continued)

HEX	ACRONYM	HEX	ACRONYM
Byte 0*		Byte 0*	
810683	N TERM-SELF (Format 1) (S)	818641	N CDINIT (S)
810685	N BINDF (S)	818642	N TERM-OTHER-CD (S)
810686	N SESSST (S)	818643	N CDTERM (S)
810687	N UNBINDF (S)	818645	N CDSESSSF (S)
810688	N SESSEND (S)	818646	N CDSESSST (S)
810810	N FORWARD (MN)	818647	N CDSESSTF (S)
810812	N DELIVER (MN)	818648	N CDSESSEND (S)
818620	N NOTIFY (SSCP-- SSCP) (S)	818649	N CDTAKED (S)
818627	N DSRLST (S)	81864A	N CDTAKEDC (S)
818640	N INIT-OTHER-CD (S)	81864B	N CDCINIT (S)

DFC, NC, and SC Codes

Byte 0 (First byte is request code.)		Byte 0 (First byte is request code.)	
02	E NC-IPL-FINAL (NC)	09	E NC-ER-TEST (NC)
03	E NC-IPL-INIT (NC)	0A	E NC-ER-TEST-REPLY (NC)
04	E NC-IPL-TEXT (NC)	0B	E NC-ER-ACT (NC)
04	N LUSTAT (DFC)	0C	E NC-ER-ACT-REPLY (NC)
05	N RTR (DFC)	0D	E ACTLU (SC)
05	E LSA (NC)	0D	E NC-ACTVR (NC)
06	E NC-ER-INOP (NC)	0E	E DACTLU (SC)
07	E ANSC (NC)	0E	E NC-DACTVR (NC)

(continued)

* Request Code

TABLE 48-6 (continued)

HEX	ACRONYM	HEX	ACRONYM
Byte 0*		Byte 0*	
0F	E NC-ER-OP (NC)	82	E RELQ (DFC)
11	E ACTPU (SC)	83	N CANCEL (DFC)
12	E DACTPU (SC)	84	N CHASE (DFC)
14	E ACTCDRM (SC)	A0	E SDT (SC)
15	E DACTCDRM (SC)	A1	E CLEAR (SC)
31	E BIND (SC)	A2	E STSN (SC)
32	E UNBIND (SC)	A3	E RQR (SC)
46	E NC-IPL-ABORT (NC)	C0	E CRV (SC)
70	N BIS (DFC)	C0	E SHUTD (DFC)
71	E SBI (DFC)	C1	E SHUTC (DFC)
80	E QEC (DFC)	C2	N RSHUTD (DFC)
81	N QC (DFC)	C8	N BID (DFC)
		C9	E SIG (DFC)

* Request Code

TABLE 48-7
MODIFIER VALUES AND DEFINITIONS BY CATEGORY

CATEGORY X'80' (PATH ERROR)			
MODIFIER VALUE (Hexadecimal)	DEFINITION	MODIFIER VALUE (Hexadecimal)	DEFINITION
01	Intermediate Node Failure	0B	Incomplete TH
02	Link Failure	0C	DCF Error
03	NAU Inoperative	0D	Lost Contact
04	Unrecognized Destination Address	0E	Unrecognized Origin
05	No Session	0F	Invalid Address Combination
06	Invalid FID	10	Segmented RU Length Error
07	Segmenting Error	11	ER Inoperative or Undefined
08	PU Not Active	12	Subarea PU Not Active or Invalid Virtual Route
09	LU Not Active	13	COS Not Available
0A	Too-Long PIU		

(continued)

TABLE 48-7 (continued)

CATEGORY X'40' (RH USAGE ERROR)

MODIFIER VALUE (Hexadecimal)	DEFINITION	MODIFIER VALUE (Hexadecimal)	DEFINITION
01	Invalid SC or NC RH	0D	CD Not Supported
02	Reserved	0E	Reserved
03	BB Not Allowed	0F	Incorrect Use of Format Indicator
04	EB Not Allowed	10	Alternate Code Not Supported
05	Incomplete RH	11	Incorrect Specification of RU Category
06	Exception Response Not Allowed	12	Incorrect Specification of Request Code
07	Definite Response Not Allowed	13	Incorrect Specification of (SDI, RTI)
08	Pacing Not Supported	14	Incorrect Use of (DR11, DR21, ERI)
09	CD Not Allowed	15	Incorrect Use of QRI
0A	No-Response Not Allowed	16	Incorrect Use of EDI
0B	Chaining Not Supported	17	Incorrect Use of PDI
0C	Brackets Not Supported		

(continued)

TABLE 48-7 (continued)

MODIFIER VALUE (Hexadecimal)	DEFINITION	MODIFIER VALUE (Hexadecimal)	DEFINITION
	CATEGORY X'20' (STATE ERROR)		
01	Sequence Number	08	No Begin Bracket
02	Chaining	09	Session Control Protocol Violation
03	Bracket	0A	Immediate Request Mode Error
04	Direction	0B	Queued Response Error
05	Data Traffic Reset	0C	ERP Sync Event Error
06	Data Traffic Quiesced	0D	Response Owed Before Sending Request
07	Data Traffic Not Reset		
	CATEGORY X'10' (REQUEST ERROR)		
01	RU Data Error	06	Reserved
02	RU Length Error	07	Category Not Supported
03	Function Not Supported	08	Invalid FM Header
04	Reserved	09	Format Group Not Selected
05	Parameter Error		

(continued)

TABLE 48-7 (continued)

CATEGORY X'08' (REQUEST REJECT)

MODIFIER VALUE (Hexadecimal)	DEFINITION	MODIFIER VALUE (Hexadecimal)	DEFINITION
01	Resource Not Available	14	Bracket Bid Reject -- RTR Forthcoming
02	Intervention Required	15	Function Active
03	Missing Password	16	Function Inactive
04	Invalid Password	17	Link Inactive
05	Session Limit Exceeded	18	Link Procedure In Process
06	Resource Unknown	19	RTR Not Required
07	Resource Not Available -- LUSTAT Forthcoming	1A	Request Sequence Error
08	Invalid Contents ID	1B	Receiver In Transmit Mode
09	Mode Inconsistency	1C	Request Not Executable
0A	Permission Rejected	1D	Invalid Station/SSCP ID
0B	Bracket Race Error	1E	Session Reference Error
0C	Procedure Not Supported	1F	Reserved
0D	NAU Contention	20	Control Vector Error
0E	NAU Not Authorized	21	Invalid Session Parameters
0F	End User Not Authorized	22	Link Procedure Failure
10	Missing Requester ID	23	Unknown Control Vector
11	Break	24	Unit of Work Aborted
12	Insufficient Resource	25	Component Not Available
13	Bracket Bid Reject -- No RTR Forthcoming	26	FM Function Not Supported

(continued)

TABLE 48-7 (continued)

CATEGORY X'08' (REQUEST REJECT)

MODIFIER VALUE (Hexadecimal)	DEFINITION	MODIFIER VALUE (Hexadecimal)	DEFINITION
27	Intermittent Error -- Retry Requested	39	LU-LU or SSCP-LU Session Being Taken Down
28	Reply Not Allowed	3A	LU Not Enabled
29	Change Direction Required	3B	Invalid PCID
2A	Presentation Space Alteration	3C	Domain Takedown Contention
2B	Presentation Space Integrity Lost	3D	Dequeue Retry Unsuccessful -- Removed from Queue
2C	Resource-Sharing Limit Reached	3E	Reserved
2D	LU Busy	3F	Terminate Contention
2E	Intervention Required at LU Subsidiary Device	40	Procedure Invalid for Resource
2F	Request Not Executable because of LU Subsidiary Device	41	Duplicate Network Address
30	Reserved	42	SSCP-SSCP Session Not Active
31	LU Component Disconnected	43	Required FMDS Synchronization Not Supplied
32	Invalid Count Field	44	Initiation Dequeue Contention
33	Invalid Parameter (with Pointer and Complemented Byte)	45	Permission Rejected -- SSCP will be Notified
34	RPO Not Initiated	46	ERP Message Forthcoming
35	Invalid Parameter (with Pointer Only)	47	Restart Mismatch
36	PLU/SLU Specification Mismatch	48	Cryptography Function Inoperative
37	Queuing Limit Exceeded	49	Reserved
38	Reserved	4A	Presentation Space Alteration

(continued)

TABLE 48-7 (continued)

CATEGORY X'08' (REQUEST REJECT)

MODIFIER VALUE (Hexadecimal)	DEFINITION	MODIFIER VALUE (Hexadecimal)	DEFINITION
4B	Request Resources Not Available	64	Function Abort: Loop Will Occur Upon Reexecution
4C	Permanent Insufficient Resource	65	Function Abort: Sender Responsible to Detect Loop
4D	Invalid Session Parameters -- BF	66	Function Abort: Receiver Responsible to Detect Loop
4E	Invalid Session Parameters -- PRI	67	Sync Event Response
4F - 50	Reserved	68	No Panels Loaded
51	Session Busy	69	Panel Not Loaded
52	Session with Larger Activation Request Sequence Identifier Already Active	70	Reserved
53	TERMINATE (Cleanup) Required	71	Read Partition State Error
54 - 55	Reserved	72	Orderly Deactivation Refused
56	SSCP-SSCP Session Lost	73	Virtual Route Not Defined
57	SSCP-LU Session Not Active	74	ER Not in a Valid State
58	Reserved	75	Incorrect or Undefined Explicit Route Requested
59	REQECHO Data Length Error	76	Nonreversible Explicit Route Requested
5A - 5F	Reserved	77	Reserved
60	Function Not Supported -- Continue Session	78	Insufficient Storage
61	Invalid COS Name	79	Storage Medium Error
62	Medium Presentation Space Recovery	7A	Format Processing Error
63	Referenced Local Character Set Identifier (LCID) Not Found		

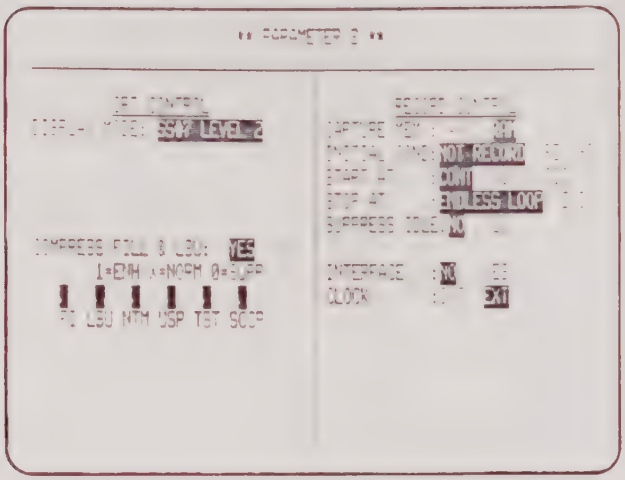

Figure 48A-1

48A
SS#7 CAPABILITIES

SS#7 (CCSS#7) is an abbreviation for the CCITT-defined Common Channel Signalling System #7. The COMSTATE II provides a special display for Level 2 (link) protocol and Level 3 (network management) protocol. In addition, certain elements in the display can be enhanced or suppressed according to entries made on the Parameter 2 screen.

48A.1 SET UP FOR SS#7

48A.1.1 Parameter 1

The Format selection on the Parameter 1 screen should be 7E/X.25 when SS#7 is analyzed. Frame Mod, Packet Mod, and Frame Addr Length selections do not apply.

48A.1.2 Parameter 2

Applicable Display Modes for use with SS#7 are SS#7 Dual, SS#7 Level 2, SS#7 Level 3, Prompt/State, and Prompt. Other selections available with these displays can also be used. (Frame and packet traces are not applicable.) See Section 18 for further details on Parameter 2 selections. See Sections 45.1 and 45.4 through 45.6 for additional information on display control.

NOTE: It is recommended that SS#7 Dual mode be used for high speed operation.

48A.2 DISPLAY MODE: SS#7 LEVEL 2

Different selections appear on the Parameter 2 screen when SS#7 Level 2 has been selected. (See Figure 48A-1.)

48A.2.2 Compress Fill and LSU

The default for this selection is YES. This means that redundant Fill-In and Link Status Signal Units are not only suppressed from the display in Run Mode but are also not stored in the CRT memory buffer and cannot be redisplayed. That is, only the first in a series of identical Link Status or Fill-In Signal Units is displayed and saved in the CRT buffer. Subsequent identical units are compressed, until a different type of signal unit is transmitted on the same side of the line. Select NO to view each of these signal units or to store them in the CRT buffer.

If you wish to suppress all Fill-In Units or Link Status Units, you may use the bottom line of the Parameter 2 screen. Type a "0" in the square above FI to suppress Fill-In Signal Units; type a "0" above LSU to suppress Link Status Signal Units. Type a "1" in the appropriate square to enhance either of these signal units as it appears on the

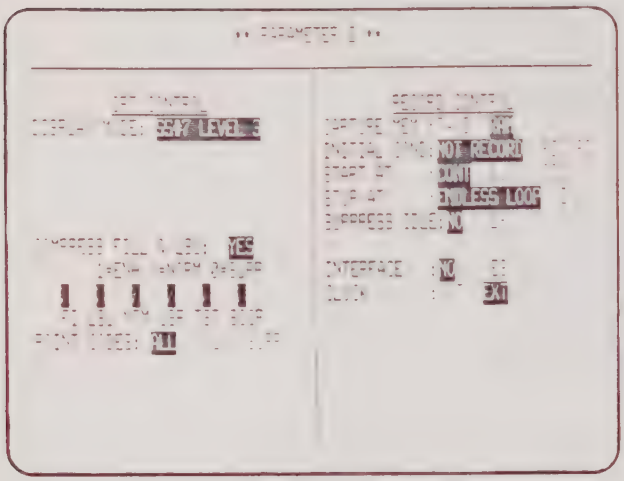

Figure 48A-2

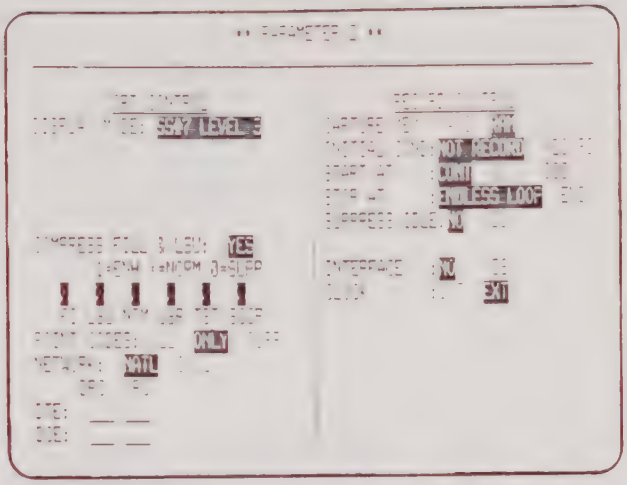

Figure 48A-3

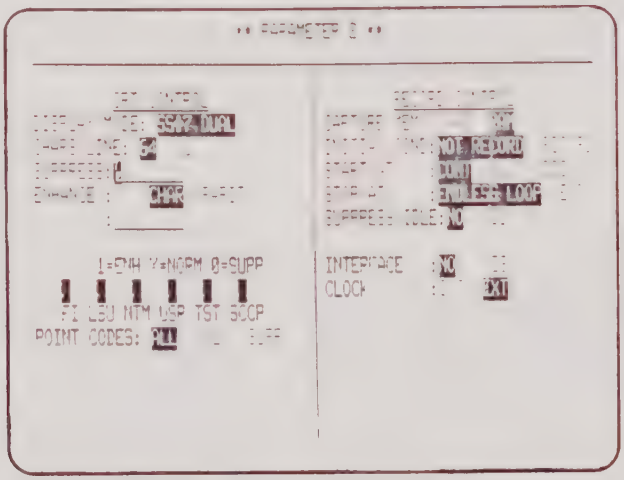

Figure 48A-4

display. Type an X over a former entry or use the CLEAR key to return to normal display of these units.

NOTE: Suppressing Fill-In Signal Units or Link Status Signal Units does not influence the storage of these units in the CRT buffer. Use the COMPRESS option discussed in this section to control storage.

Four types of Message Signal Units (MSU's) are also listed at the bottom of the Parameter 2 screen: NTM (Network Management), USR (User Part), TST (Test), and SCCP (Signalling Connection Control Part) messages. These MSU's can be suppressed or enhanced in the same way.

NOTE: "TST" is used to suppress or enhance both NTR (regular testing) and NTS (special testing) MSU's.

48A.3 SS#7 LEVEL 3

The Parameter 2 selections described in Section 48A.1 for Level 2 are available when SS#7 Level 3 is the Display Mode. (See Figure 48A-2.)

One further display control, Point Codes, also appears at the bottom of the screen. By default, all point codes are displayed. Select ONLY to confine the display to certain point codes. Select SUPPress to eliminate only certain point codes. New fields appear at the bottom of the screen when either ONLY or SUPP is selected. (See Figure 48A-3.)

The NETWORK field allows you to specify whether the point codes follow US Standard (NATL) Format or International (INTL) Format. The default selection is NATL. This causes the COMSTATE II to expect a 56-bit routing label. The INTL selection causes the COMSTATE II to expect a 32-bit routing label with a slightly different format. (See Figure 48A-14.)

NOTE: When Option 08 is installed, the anticipated National Format changes. Both National (the default) and International labels become 32-bit routing patterns. However, the NATL and INTL selections on Parameter 2 distinguish between National and International Network Indicators (see Figure 48A-14). As a result, you are able to isolate national or international traffic, even when the point codes are the same.

Once you have selected the correct format, enter the Destination Point Codes (DPC's) or Originating Point Codes (OPC's) you wish to display or suppress. With the HEX key on, enter the point code on the appropriate line (DTE or DCE) and in the correct column (DPC or OPC). Enter three bytes (two hex characters per byte) if US Format is selected. Enter two bytes (two hex characters per byte) if National (Option 08 only) or International Format is selected. Enter the most significant byte of the point code first. (See Figure 48A-14 for format.)

NOTE: To represent a 14 bit National or International point code using a two byte (16 bit) field, assume that the two most significant bits are zero's. This means that the range of valid values is 0000 to 3FFF.

48A.4 SS#7 DUAL LINE

The same Parameter 2 selections available with SS#7 Level 3, except for COMPRESS options, appear when SS#7 Dual is the Display Mode. (See Figure 48A-4.) Make these selections as described in Section 48A.3.

Any frame SUPPRESS or ENHANCE selections will not be active in SS#7 Dual display. However, the selected frames will be enhanced or suppressed when the screen is frozen and an SS#7 trace is displayed.

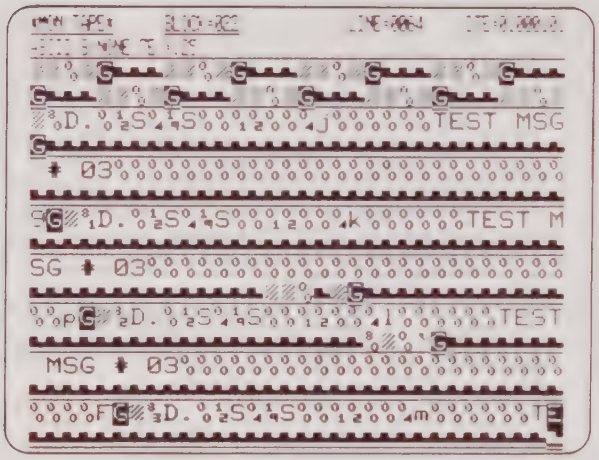

Figure 48A-5

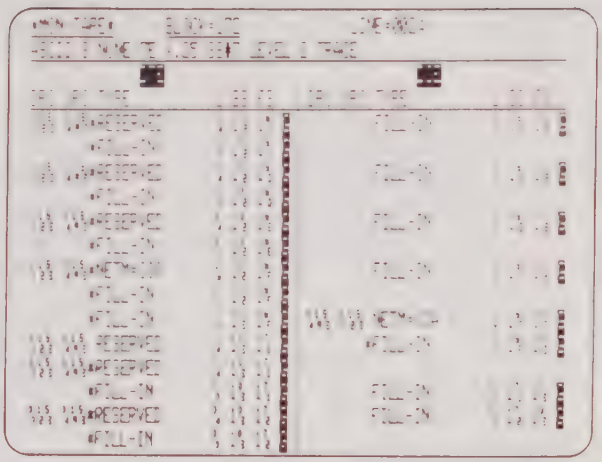

Figure 48A-6

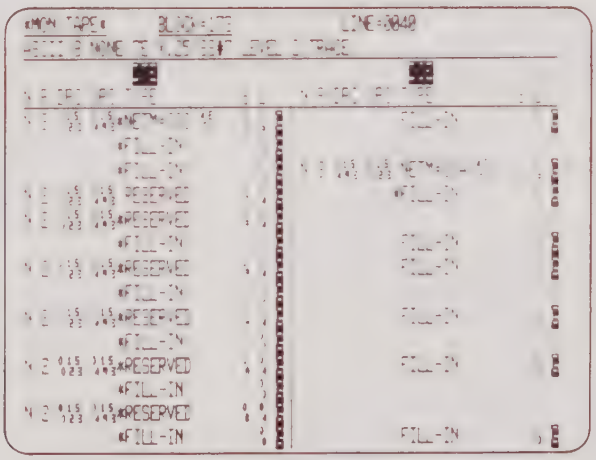

Figure 48A-7

SS#7 Dual-line display resembles other dual-line displays, with TD and RD data appearing on alternate lines. Time-correlation between the two leads is maintained, and RD data is always underlined. Refer to Sections 8.2 and 17.1 for a further description of dual-line data.

Use SS#7 Dual display for high-speed monitoring and testing of SS#7 data in real-time. Then, for a Level 2 or Level 3 analysis, use the trace and frame locator options available in Freeze Mode. (See Section 48A.6.)

Trace displays can be used to analyze data played back at lower speeds, once it has been recorded into high-speed RAM, or once it has been transferred from the CRT buffer to tape.

48A.5 DISPLAY IN RUN MODE

Figure 48A-5 shows SS#7 data being monitored in SS#7 Dual-line mode, with 7E flags suppressed. The header lines appear as they would in a regular 7E/X.25 data display. This is because 7E/X.25 has been selected as Format on the Parameter 1 menu. However, Level 2 and Level 3 analysis in Freeze Mode is specific to SS#7.

48A.5.1 SS#7 Trace Displays

SS#7 Level 2 and Level 3 traces (see Figures 48A-6 and 48A-7) are similar to other trace displays. Standard header lines appear at the top of the screen.

The remainder of the screen is divided in half. Data from the DTE side of the line is displayed on the left side of the screen, DCE data on the right side. Signal units are displayed sequentially from top to bottom. When a DTE and a DCE signal unit are received at approximately the same time, they appear on the same line. The signal unit received first is marked by an asterisk at the beginning of the Type column. Refer to Section 47.3 for a detailed discussion of trace display options. SS#7 trace data is described in the following sections.

(a) SS#7 Level 2. SS#7 Level 2 selected on the Parameter 2 screen provides a Run-mode display resembling Figure 48A-6. Each half of the screen is divided into seven columns. The first two columns show the Destination Point Code (DPC) and the Originating Point Code (OPC) when a Message Signal Unit is displayed. Since data broken down in Figure 48A-6 is US Standard Format, three hex bytes are present in both DPC and OPC columns. (Only two hex bytes are present when data is in International or Option 08 National Format.)

> NOTE: International and Option 08 National point codes, which are actually 14 bits long, are represented here as two bytes (16 bits). The COMSTATE II pads the two most significant binary positions with zero's in order to provide an accurate hex interpretation.

The Type column lists the signal unit type (Status or Fill-In) or the message type when the signal unit is a Message Signal Unit.

Additional information may be given in this column, depending on the type of signal unit being analyzed. (See Figure 48A-6.) The lay-out for the three types of signal units are shown in Figures 48A-12 through 48A-14. Mnemonics and values for frame types are defined in Table 48A-2. Definitions and values of significant sub-fields are given in Tables 48A-1 through 48A-4.

The value of the Length Indicator byte (L) is given in the fourth column of the display. A value of 00 here indicates a Fill-In Signal Unit, a value of 01 or 02 indicates a Link Status Signal Unit, and a value of 03-63 indicates a Message Signal Unit.

The fifth column (BS) provides two pieces of information: the value of the Backward Indicator Bit (0 or 1), followed by the Backward Sequence Number, a hexadecimal value.

The sixth column (FS) provides the Forward Indicator Bit (0 or 1), followed by the Forward Sequence Number in hexadecimal notation.

The results of the block check appear in a final, unlabelled column. A reverse video G indicates a Good BCC, a highlighted B a Bad BCC, and a highlighted A an Abort. See Section 45.6 for more information on BCC's for Bit-Oriented Protocols.

(b) SS#7 Level 3 Display. The SS#7 Level 3 display, although similar in format to the Level 2 trace, provides additional information. (See Figure 48A-7.) There are eight columns in this display. The first column (labelled N) interprets the Network Indicator. "N" on subsequent lines indicates US (National) Format; "I" indicates International Standard Format. The values 1 (reserved for US or National use) and 3 (reserved for International use) may also be displayed.

The second column (P) gives the Priority code. The Priority code has a value of 0-3 for US Format. These bits are spare in International Format. They are also spare bits in National Format when Option 08 is installed. However, their value is displayed in all cases.

The next two columns (DPC and OPC) provide the Destination Point Code and the Originating Point Code.

The Type column defines the type of Signal Unit (or the message type for MSU's) and other pertinent information.

The sixth column (S) gives the hex value (one byte) of the signalling link selection. The value of the length indicator byte is given in hex in the next column (L). This is followed by a highlighted G, B, or A to indicate the results of block checking. See Section 45.6 for a further description of block-checking in Bit-Oriented Protocol.

NOTE: In MSU's which are incomplete, the header is expanded if sufficient information is present. Additional unexpanded bytes displayed may include the first FCS byte followed by FF bytes which pad to the end of the frame display.

Mnemonics which appear in the Level 3 trace are defined in Tables 48A-1 through 48A-4.

48A.6 FREEZE MODE

SS#7 displays can be frozen like other displays in Run Mode. Refer to Sections 10 and 47.3.2 for a full description of Freeze Mode and Freeze Mode operations.

48A.6.1 Changing Displays in Freeze Mode

It is possible to alternate between data and Level 2 and Level 3 displays in Freeze Mode. Press the TRACE key to move from data to a Level 2 trace. Press the TRACE key again to move to a Level 3 trace. The top line of data interpreted on one display will correspond to the top line of data on alternate displays. (See Figures 48A-8 and 48A-9.)

To redisplay raw data, press the DATA key. Press the DATA key again to move to a larger or more condensed display (to shift between 64 and 32 characters per inch.)

As before, the B and E keys move the display to the beginning and end of the buffer. The cursor arrows are used to scroll through the data.

48A.6.2 Automatic Level 2 and Level 3 Locators

Automatic Level 2 and Level 3 locators are available for analysis of SS#7 data. To use the automatic locators, freeze the screen. (Then press the DATA key if an SS#7 trace is displayed.) Use the F key to move from frame to frame. A Level 2 expansion of the current frame will appear at the top of the screen. (See Figure 48A-10.) The information given in the Level 2 expansion is the same shown for that frame in the SS#7 Level 2 Trace. Each item analyzed in the expanded frame appears to the left of an equal sign (=). The description of that item appears to the right. From left to right, the Level 2 expansion defines the following: Signal Unit or MSU type; Destination Point Code (DPC); Originating Point Code (OPC); Length Indicator (L); Backward Indicator Bit and Backward Sequence Number in hex (BS); and Forward Indicator Bit and Forward Sequence Number in hex (FS).

Press the P key for a Level 3 expansion of each frame. Figure 48A-11 gives the Level 3 expansion for the same frame shown in the Level 2 expansion (Figure 48A-10). The Level 3 expansion lists the same information for the expanded frame as is given in the SS#7 Level 3 Trace. From left to right, the expansion defines the following: Signal Unit or MSU type; the Network Format (N), which is defined as "N" for US (or National) Format; or "I" for International Format; Priority (P); Destination Point Code (DPC); Originating Point Code (OPC); Signalling Link Selection (S); and Length Indicator (L).

> NOTE: Fill-In and Link Status Signal Units are not located or expanded when the P key is used, since these contain only Level 2 information.
>
> Incomplete frames less than three bytes long may not be located by the P key; however, the F key will locate them.

Sections 47.1 and 47.2 fully describe the use of frame and packet locators.

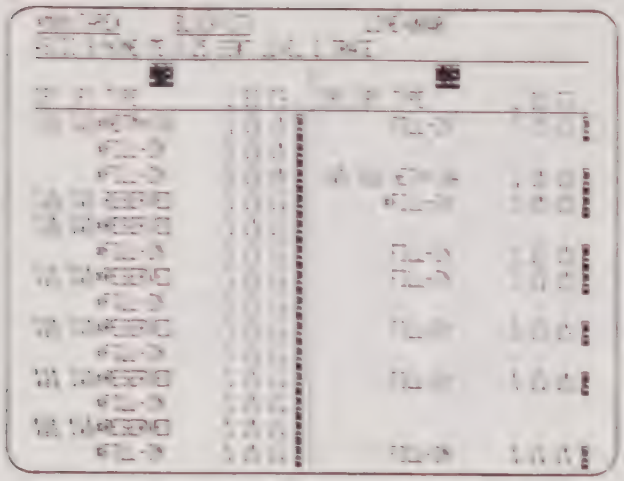

Figure 48A-8

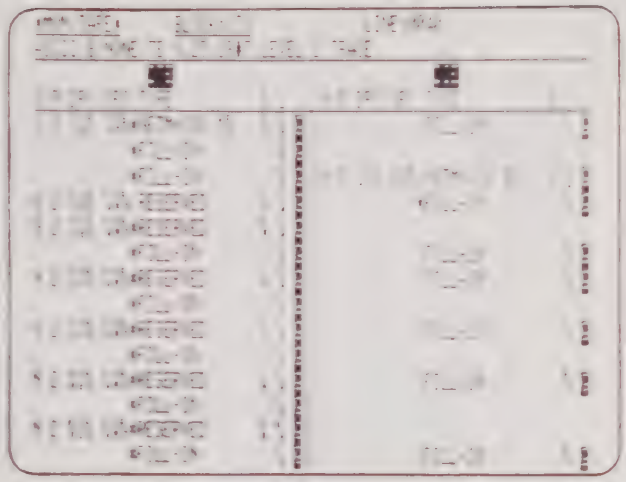

Figure 48A-9

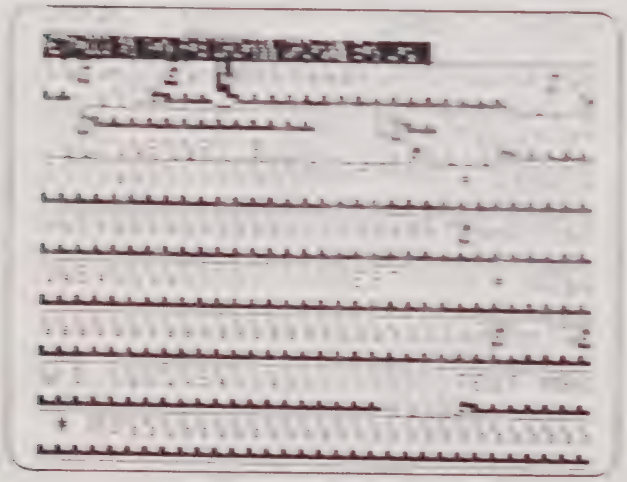

Figure 48A-10

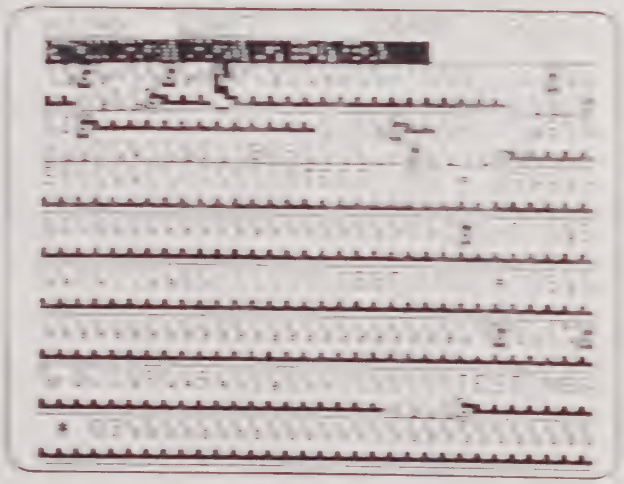

Figure 48A-11

48A.7 SS#7 FRAME STRUCTURES AND VALUES

The format for Fill-In Signal Units is shown in Figure 48A-12. The structure for Link Status Signal Units is given in Figure 48A-13. Table 48A-1 lists possible LSU status values.

Figure 48A-14 shows the general structure of a Message Signal Unit. Figure 48A-15 illustrates how International labels are entered and transmitted. (With Option 08, National labels are entered and transmitted in the same way.) MSU types are defined in Table 48A-2, and Tables 48A-3 and 48A-4 define possible MSU headers for Network Management and SCCP MSU's, respectively.

NOTE: Frame format, unless otherwise stated, reflects the frame as displayed on the COMSTATE II screen, not the actual transmission order.

48A.8 INTERACTIVE OPERATION WITH SS#7

Interactive Testing can be performed using SS#7 protocol. The automatic Bit-Oriented Protocol frame and packet selections on trigger and message menus are not applicable, however. Search and transmit strings must be entered manually.

The COMSTATE II is not designed to maintain a dynamic SS#7 communication environment.

NOTE: It is recommended that SS#7 trace displays not be used with an interactive test (emulate) mode operating at high speeds. Instead, select SS#7 Dual line as the display mode on the Parameter 2 screen.

NOTES:

(1) Length Indicator has a value of 3 to 63.

(2) The Service Information Octet contains a Service Indicator (Table 48A-2), Bits 3-0 and a Network Indicator, Bits 7-6. In US Format only, a Priority Code is present in Bits 5-4. Bits 5-4 are spare in International Format (and in National Format if Option 08 is installed).

(3) The Signalling Information field contains a Label and a Header. There are two label formats: US, a 56 bit format, and International, a 32 bit format. With Option 08, the National label follows the same format as the International label. (See expansions, this figure.) The header is located at Octet 9 in International or National Format and at Octet 12 in US Format.

(4) The two octets preceding the closing flag are block check results. Only the first octet will appear in SS#7 line data. The second is replaced by the block check symbol (G, B, or A). See Section 45.6 for an explanation of block checking in Bit-Oriented Protocols.

(5) Network Indicators 00-01 = International Format
10-11 = US (or National) Format

(6) The Priority Code has a value of 0-3 for US Format. These bits are undefined for International Format. They are also undefined in National Format when Option 08 is installed.

(7) A Service Indicator with Bits 3-2 = 01 indicates a User Part. The subsequent structure of the signal unit is dependent on the User Part Type and is not reflected by this figure.

(8) The header gives the Network Management Header (Table 48A-3), SCCP Message Type (Table 48A-4), or Test Header.

In Test Messages (SIO = 0001 or 0010), the four low-order bits determine the type. A value of

0001 = LTM (Link Test Message)
0010 = LTA (Link Test Acknowledge).

The four high-order bits are not defined.

(9) Since the label in International Format is not byte-aligned, the values displayed in hexadecimal on the COMSTATE II screen are skewed. The same holds true for labels in National Format when Option 08 is installed. As a result, International and National labels must be interpretted as illustrated in Figure 48A-15.

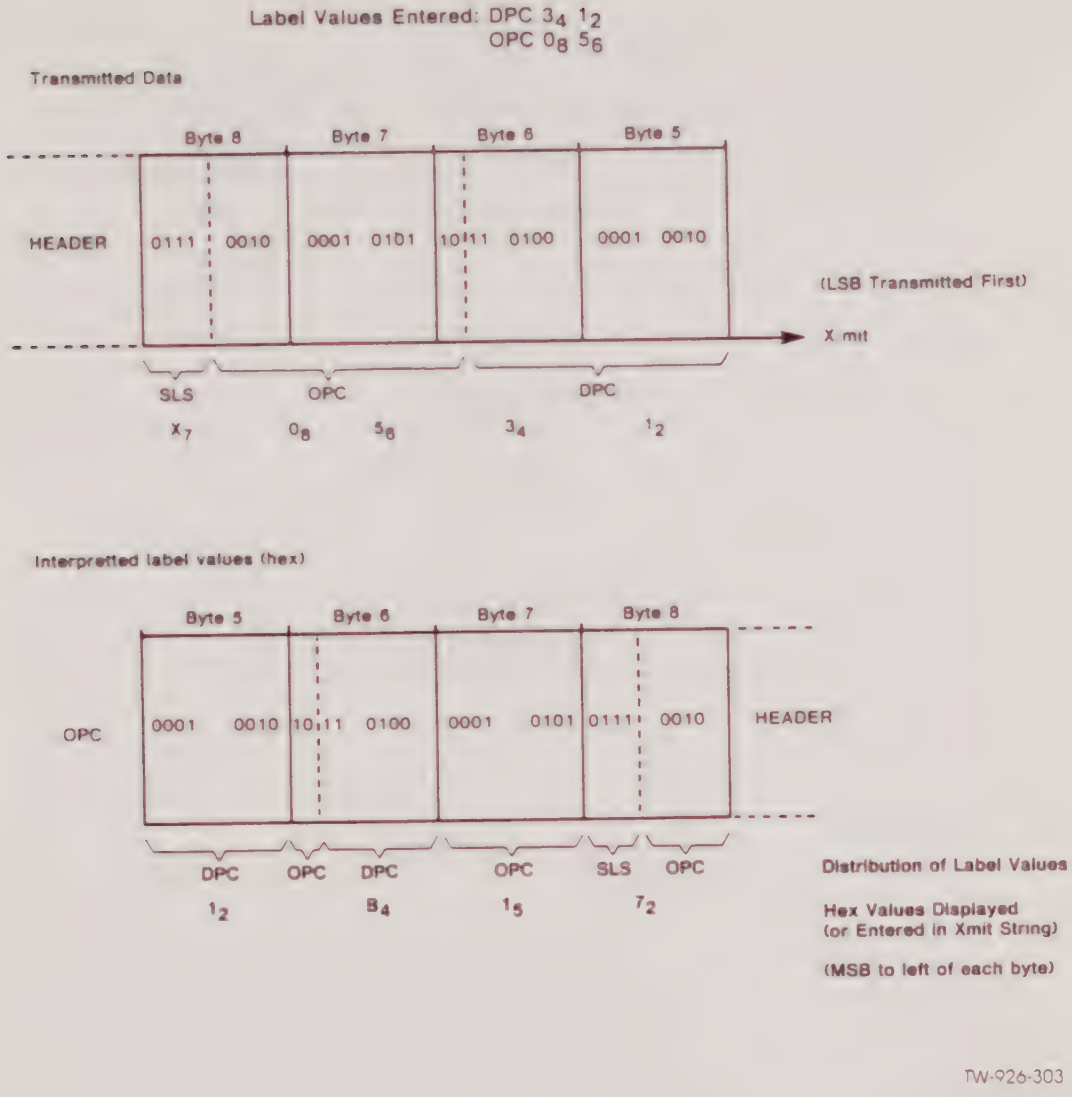

Figure 48A-15

TABLE 48A-1
LSU STATUS FIELD
(Bits 2-0 of first Status Field Octet)

ACRONYM	DEFINITION	BINARY VALUE
O	Out of Align	000
N	Normal	001
E	Emergency	010
OS	Out of Service	011
PO	Processor Outage	100
B	Busy	101

Bits 7-3 of the First Status Field Octet (SFO) are spare.
A second Status Field Octet may be present.

TABLE 48A-2
MSU Service Indicators
(Bits 3-0 of the SIO)

ACRONYM	MEANING	BINARY VALUE
NETM	Network Management	0000
NTR(1)	Regular Testing	0001
NTS(1)	Special Testing	0010
SCCP	Signalling Connection Control Part	0011
TUP(2)	Telephone User	0100
ISDN(2)	ISDN User	0101
DUP0(2)	Data user (Call/Circuit)	0110
DUP1(2)	Data User	0111
----	Spare	1000
----	Spare	1001
---	Spare	1010
----	Spare	1011
----	Spare	1100
----	Spare (or ECIS6 if US format)	1101
----	Spare(3)	1110
----	Spare	1111

(1) TST on Parameter 2 screen pertains to both NTR and NTS.

(2) USR on Parameter 2 screen pertains to all of these.

(3) Reserved, US format only

TABLE 48A-3
Network Management Headers
(Octet 9 for International and National Format;
Octet 12 for US Format)

ACRONYM	DEFINITION	HEX VALUE	ADDITIONAL BYTES SHOWN	
			US	Nat'l (Opt. 08) or Int'l
COO	Changeover Order	11	2	1
COA	Changeover Acknowledge	21	2	1
CBD	Changeback Declaration	51	2	1
CBA	Changeback Acknowledge	61	2	1
ECO	Emergency Changeover Order	12	1	0
ECA	Emergency Changeover Ack	22	1	0
RCT	Route-Set-Congestion-Test	13	0	0
TFC	Transfer Controlled	23	4	2
TFP	Transfer Prohibited	14	3	2
TCP(1)	Transfer Cluster Prohibited	24	3	2
TFR	Transfer Restricted	34	3	2
TCR(2)	Transfer Cluster Restricted	44	3	-
TFA	Transfer Allowed	54	3	2
TCA(3)	Transfer Cluster Allowed	64	3	2
RSP(4)	Route-Set-Test Dest. Prohibited	15	3	2
RCP(2)	Route-Set-Test Cluster Prohibited	25	3	-
RSR(2)	Route-Set-Test Dest. Restricted	35	3	-
RCR(2)	Route-Set-Test Cluster Restricted	45	3	-

(cont.)

TABLE 48A-3

Network Management Headers (continued)

ACRONYM	DEFINITION	HEX VALUE	ADDITIONAL BYTES SHOWN	
			US	Nat'l (Opt. 08) or Int'l
LIN	Link Inhibited	16	1	0
LUN	Link Uninhibited	26	1	0
LIA	Link Inhibited Acknowledge	36	1	0
LUA	Link Uninhibited Acknowledge	46	1	0
LID	Link Inhibited Denied	56	1	0
LFU	Link Force Uninhibited	66	1	0
DLC	Data Link Connection Orders	18	2	2
CSS	Connection Successful	28	1	0
CNS	Connection Not Successful	38	1	0
CNP	Connection Not Possible	48	1	0

(1) If International or National (Option 08) Format, TPA, Transfer Prohibited Acknowledgement.

(2) US Format only.

(3) If International or National (Option 08) Format, TAA, Transfer Allowed Acknowledgement.

(4) If International or National (Option 08) Format, RST, Route-Set-Test signal for prohibited destination.

TABLE 48A-4
SCCP MESSAGE TYPE
(Octet 9 for International or National format, Octet 12 for US format)

ACRONYM	DEFINITION	HEX VALUE
CR	Connection Request	01
CC	Connection Confirm	02
CREF	Connection Refused	03
RLSD	Released	04
RLC	Release Complete	05
DT1	Data Form 1	06
DT2	Data Form 2	07
AK	Data Acknowledgement	08
UDT	Unitdata	09
UDTS	Unitdata Service	0A
ED	Expedited Data	0B
EA	Expedited Data Acknowledgement	0C
RSR	Reset Request	0D
RSC	Reset Confirmation	0E
ERR	Error	.0F
IT	Inactivity Test	10

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Figure 49-1

TABLE 49-1
7E/X.25 AND SDLC IDLE LINE CONDITIONS

Line Use Selection (Parameter 4 Menu)	Idle Line Condition
Switched	Idles FFs (8 consecutive 1's) between frames (that is, between closing and opening flags).
FDX	Idles flags.
Em Host	Idles flags.
Em Drop	Idles FFs (8 consecutive 1's) between frames (that is, between closing and opening flags).

49
BIT-ORIENTED PROTOCOLS: INTERACTIVE OPERATION

49.1 IDLE LINE CONDITION

Table 49-1 shows the idle line condition generated by the INTERVIEW COMSTATE II. The idle condition is maintained in Program Mode as well as Run Mode.

When 7E/X.25 has been selected, seven consecutive 1's between closing and opening flags are not considered to be an abort. When SDLC or SDLC/NRZI is selected, seven consecutive 1's between closing and opening flags are considered to be an abort and if Display Abort is ON, a bright reverse-image A will be displayed.

49.2 BIT PATTERNS AND HEXADECIMAL ENTRIES

Bit patterns are displayed with Bit 8 -- the last bit sent -- as the highest-order bit and Bit 1 -- first bit sent -- as the lowest-order bit. Be sure to follow this convention whenever you are converting binary to hexadecimal for making a data entry on a menu.

In the frame and packet data-entry fields of the Trigger Actions menus and the Message-Entry menus, all hexadecimal entries are made without the HEX key and each hexadecimal digit is given one full character position in the field. The HEX key is illegal in these fields.

In the TEXT fields of both menus, the HEX key is legal and must be used to make hexadecimal entries; every two consecutive hexadecimal digits are displayed in one character space.

Exceptions occur on the Message-Entry menus when CALL ACC or CALL REQUEST has been selected for packet type. The CALLING DTE ADDR field and the CALLED DTE ADDR field accept only decimal numbers and all hexadecimal entries are illegal.

49.3 TRIGGER TRANSMIT ACTION

(a) Transmitting Block Check Characters. For the three HDLC protocol selections, select GD, BD, or ABort on the XMIT line of the Trigger Actions menu (Figure 49-1). The BCC type for these formats is always automatically selected (see Section 16.3). For BSC/X.25, the BCC type is also automatic but NO replaces the ABort selection on the Set Xmit line.

For the HDLC formats, CRC-16 will be transmitted for bad BCC; for BSC/X.25, the transmitted bad BCC will be an inverted good BCC.

(b) Begin Frame. The COMSTATE II logic will automatically translate protocol mnemonic selections into the proper bit patterns and transmit them in the correct sequence. Mnemonic selections for transmitting protocol can be made in two places: in the trigger XMIT field and on the Message-Entry menus.

The mnemonic selections on the triggers include Frame Type, Address, Poll/Final bit, Packet Type, Logical Channel Number, and Q and D bits. Send and Receive sequence numbering will be automatic (as when AUTO is selected on the Message-Entry menus; see Sections 49.6 and 49.8), with N(S) beginning at 0.

NOTE: The mnemonic selections on the Message-Entry menus are considerably more extensive than those on the Trigger menu -- they include frame and packet sequence control selections and mnemonics for cause bytes, for example. Please see Sections 49.5 through 49.8 for discussion of the Message-Entry menus.

If you want to use the trigger Xmit mnemonics, select BEGIN FRAME YES. Select NO if you wish to enter the protocol bytes yourself or use the Message-Entry menus for protocol.

(c) Frame Type. FR TYPE is a window selection field that defaults to frame type INFO. Use the ROLL key to roll the display through the following selections: RR, RNR, REJ, SREJ, SARM/DM, SABM, DISC/RD, UA, FRMR, TEST, XID, SNRM, UI, SIM/RIM, UP, CFGR, BCN, SABME, SI0, SI1, and OTHER 00. CNTL-ROLL displays these selections in the reverse order.

OTHER 00 is a data-entry field in which you can specify any bit pattern for the frame-control octet by entering a two digit hexadecimal number.

Table 49-2 shows the bit pattern that will be transmitted for the frame-control octet for each of these selections.

(d) Address. From one to three address bytes can be entered in this field. The number of bytes transmitted corresponds to the FRAME ADDR LENGTH selected on the Parameter 1 menu. Enter two hexadecimal characters for each byte. If you neglect to enter an address, 00 (hex) will be transmitted. See Section 49.14 for additional information on frame address entries.

(e) Poll/Final Bit. The P/F field is present only for certain FR TYPE selections (see Table 49-4). Select 1 or 0 to set the value of the poll/final bit. Select L for P/F loopback; that

is, to return the value of the last-received poll/final bit. The P/F bit defaults to 0.

(f) Packet Type. For BSC/X.25 or 7E/X.25 format, when INFO is selected, the packet protocol fields are presented on the next line. PK TYPE is a rotating window field of 16 selections. The default selection in the window is DATA. Use the ROLL key for quickest access to the packet types needed to set up a call; CNTL-ROLL for other packet types. Table 49-5 lists the selections and shows the bit sequence that will be transmitted by the COMSTATE II for each selection.

(g) Logical Channel Number. Enter the LCN as a three-digit hexadecimal number. If you do not enter an LCN value, LCN 000 will be sent by default. If you clear the field of all entries, the LCN transmitted will be the last LCN received.

(h) Q, D, and M Bits. Select a pattern of values for Bits 7 and 8 of the GFI and the More data bit. Where no value is entered, the 0 condition will be sent.

NOTE: The COMSTATE II transmits Modulo 8 or 128 packets, depending on the Parameter 1 PACKET MOD selection.

(i) Text Field. In the 16-character TEXT field, you can enter:

- BISYNC framing characters if BEGIN FRAME:NO is selected; X.25 protocol can then be selected on a message-entry menu and that menu specified within the BISYNC framing in the trigger Text field (see Section 49.7 for details);
- frame-level protocol if BEGIN FRAME: NO is selected;
- level-3 protocol if PK TYPE is not displayed (as for SDLC or SDLC/NRZI; see Section 48 for SNA frame structure and level-3 values.)
- message content consisting of alphanumeric, hexadecimal and control characters;
- the symbols for any of the message buffers, such as ALT-K, ALT-0, and so on (see Section 41.3).

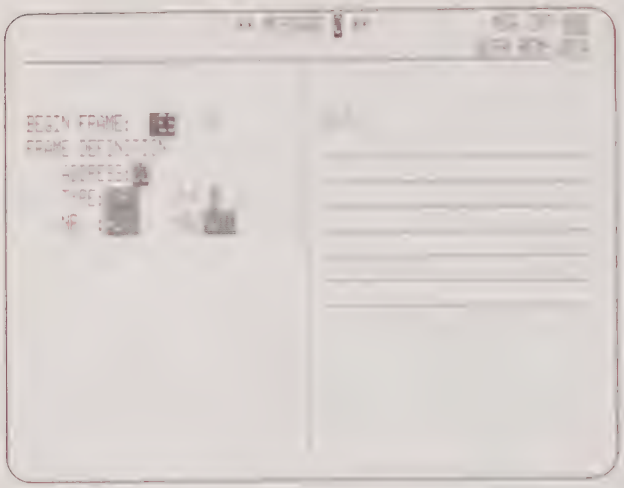

Figure 49-2

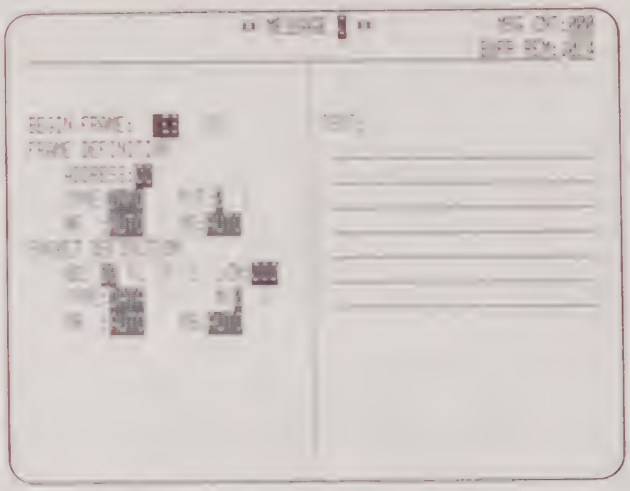

Figure 49-3

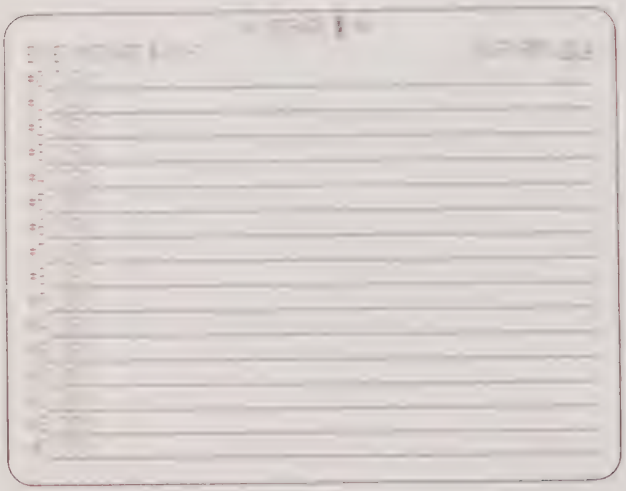

Figure 49-4 Default Message Summary for SDLC or SDLC/NRZI.

Figure 49-5 Example of Message Summary for SDLC or SDLC/NRZI with various frame types selected.

49.4 THE MESSAGE SUMMARY

For BSC/X.25 and the three HDLC-framed formats, frame protocol for all transmissions may be selected by filling out special Frame Definition fields on the message-entry menus (see Figure 49-2, for example). For BSC/X.25 and 7E/X.25, there are also Packet-Definition fields (see Figure 49-3).

When an SDLC format is selected on the Parameter 1 menu, at the beginning of each line on the Message Summary is displayed the frame type currently selected on the message-entry menu. The default display is INFO, for INFOrmation frames. Figure 49-4 shows the default Message Summary for SDLC; Figure 49-5 shows the same menu with other frame types selected.

When an X.25 format is selected on the Parameter 1 menu, the selected frame type will be displayed on the summary unless it is INFO. For INFO, the Message Summary will display the packet type selected for that menu. Figure 49-6 shows the default Message Summary for X.25; Figure 49-7 shows a summary for X.25 when other frame and packet types are selected. Notice that entries in fields such as DIAGNOSTICS and CALLING DTE ADDR that actually utilize the first line of the Text area appear on the summary.

If BEGIN FRAME is not selected on a Message-Entry menu, the frame or packet type will not appear on the summary.

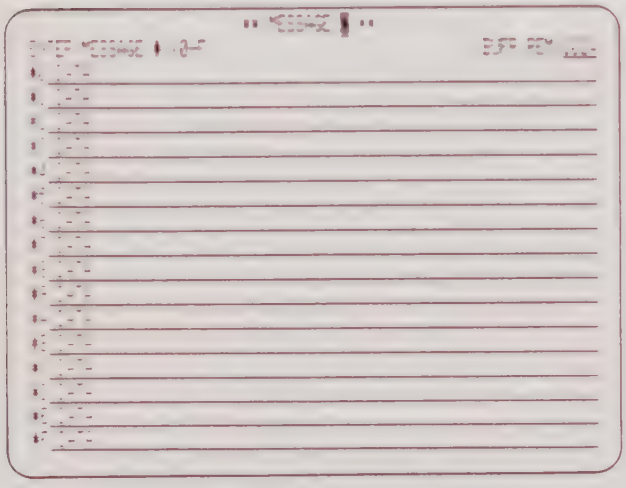

Figure 49-6 Default Message Summary for BSC/X.25 or 7E/X.25.

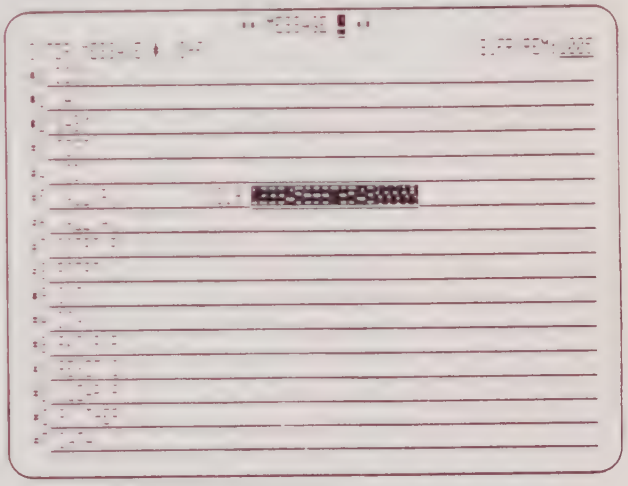

Figure 49-7 Example of Message Summary for BSC/X.25 or 7E/X.25 with various frame types selected.

49.5 USING THE MESSAGE-ENTRY MENUS

The selections for automatic transmission of protocol bytes appear on a Message-Entry menu only when the Parameter 1 Format selection is BSC/X.25, 7E/X.25, SDLC, or SDLC/NRZI and BEGIN FRAME:YES is selected.

The default selection for BEGIN FRAME is YES, which enables all the following selections on the menu. If you select NO, only the TEXT lines will remain. Select NO if the text is to be a continuation of a frame entered on another message menu or on a Trigger Actions menu or if you are going to enter the protocol manually.

For 7E/X.25 and BSC/X.25 (see Figure 49-3), both FRAME DEFINITION and PACKET DEFINITION selections will be displayed. For SDLC and SDLC/NRZI (Figure 49-2), only FRAME DEFINITION selections are shown, and any level 3 protocol should be entered in the Text fields of the menu. (See Section 48 for SDLC frame structure and level-2 and level-3 values.)

49.6 FRAME DEFINITION

(a) Address. One to three address bytes can be entered in this field. The number of address bytes transmitted corresponds to the FRAME ADDR LENGTH selected on the Parameter 1 menu. Enter two hexadecimal characters for each byte in the address. If you neglect to enter an address, 00 (hex) will be transmitted. Refer to Section 49.14 for further information on frame address entries.

(b) Type. This is a window selection field that defaults to frame type INFO. Use the ROLL key to roll the display through the following selections: RR, RNR, REJ, SREJ, SARM/DM, SABM, DISC/RD, UA, FRMR, TEST, XID, SNRM, UI, SIM/RIM, UP, CFGR, BCN, SABME, SI0, SI1, and OTHER 00. CNTL-ROLL displays these selections in the reverse order. Table 49-2 shows the bit pattern that will be transmitted as the frame-control byte for each of these selections.

OTHER 00 is a data-entry field in which you can specify any bit pattern for the frame-type byte by entering a two digit hexadecimal number.

The Type selection determines which of three fields -- NR, P/F, and NS -- will be displayed on the next line (see Table 49-4).

(c) NR (Receive Sequence Count). This is a window field with two selections. AUTO is the default selection. If you select AUTO, the N(R) sent will be the last good received N(S) incremented by 1. The received N(S) is good if it is in sequence and the block had a good block check. The COMSTATE II will not increment the N(R) count until a good N(S) is received.

The alternative selection in the window is a data-entry field in which you may enter a numerical value for NR. For Modulo 8 frames, enter a 1-digit hexadecimal number (0 through 7). For Modulo 128 frames, enter a one or two digit hexadecimal number (0 through 7F).

The number entered will be sent each time. If you select this field but don't enter an NR, the default entry 0 (zero) will be sent. If a specific N(R) is sent using this selection, then that N(R) will be the next received N(S) that is expected.

(d) P/F Bit. The P/F field is present only for certain TYPE selections (see Table 49-4). Select 1 or 0 to set the value of the poll/final bit. Select LPBK to return the value of the last P/F bit received.

(e) NS (Send Sequence Count). This is a window selection field with four selections: AUTO, LAST REC NR, SKIP, and a data-entry field. The default choice is AUTO. If you select AUTO, then the N(S) count will always increment by one with each frame sent unless the message is aborted.

If you select LAST REC NR, the N(S) transmitted will be the value of the last N(R) that was received in sequence and in a block with a good BCC. This can be used to respond to a REJECT.

SKIP forces N(S) errors by causing the N(S) count to increment by 2.

If you enter a numerical value for N(S), that number will be sent each time. For Modulo 8 frames, enter a 1-digit hexadecimal number (0 through 7). For Modulo 128 frames, enter a one or two digit hexadecimal number. The default value of 0 (zero) will be sent if you select this field but do not enter a number. If a specific N(S) is sent, then the next N(S) will be that N(S) plus 1 if AUTO is used.

NOTE: A Trigger Action of Reset NR/NS will return N(R) and N(S) to zero when AUTO is selected. N(S) will increment to one after a reset if SKIP has been selected.

49.7 TRANSMITTING BSC/X.25 FRAMES

Automatic frame selections on Trigger Actions menus or Message menus can be used to transmit BSC/X.25 frames when a few simple rules are followed.

(a) Sending BSC/X.25 frames from Trigger Actions menus. Select BEGIN FRAME: YES, then the type of frame to be transmitted. In the TEXT field, be sure to include Bisync control characters to indicate the end of frame data (DLE ETX). These will be placed at the end of the frame and followed by the type of Block Check indicated.

(b) Sending BSC/X.25 frames from the Message Buffer. Select XMIT: YES and BEGIN FRAME: NO on the Trigger Actions menu. In the TEXT field, enter Bisync synchronization and start of text characters (SYNC SYNC DLE STX). (For convenience, this string may be entered as TEXT in a separate message menu. BEGIN FRAME: NO should be selected on the message menu. The number of this message must appear in the first position of the trigger transmit string.)

Follow with the number of the message menu to be used for the frame. Select BEGIN FRAME: YES on the appropriate message menu. Specify the type of frame to be sent. Be sure to end the frame with Bisync control characters (DLE ETX). These may be entered as the last characters in the TEXT field of the message menu, or they may be placed at the end of the TEXT field on the Trigger Actions menu. (For convenience, you may enter them in a message buffer as straight TEXT. The number of this message menu can then be placed at the end of the trigger transmit string.) The terminating bisync characters will be transmitted at the end of the frame and followed by the type of block check indicated on the Trigger Actions menu.

X.25 Frame and X.25 Packet display modes can be used when these rules are employed. Automatic Frame and Packet locators can also be used.

49.8 PACKET DEFINITION

Packet protocol selections appear on the Message-Entry menus only for either of the two X.25 Format choices on the Parameter 1 menu. Figure 49-3 is the default menu for this configuration. The logic can handle sequence counts -- Modulo 8 or 128 -- for as many as six LCNs selected on the Trigger Actions and Message-Entry menus.

NOTE: Sequence counts for an LCN will be reset automatically when that LCN is taken off the active LCN list (see Section 49.11) or when Reset PR/PS for that LCN has been selected as a trigger action. To take down a call, for example, without inactivating the LCN, select 0 for P(S) and P(R).

(a) Q and D Bits. Select the correct pattern of values for the first two bits in the packet.

NOTE: The COMSTATE II transmits Modulo 8 or 128 packets, depending on the Parameter 1 PACKET MOD selection.

(b) Logical Channel Number. Enter the LCN as a three-digit hexadecimal number. LCN 000 will be transmitted by default. If the LCN is cleared of all digits, however, the COMSTATE II will retransmit the LCN of the last received packet.

(c) Packet Type. This is a rotating window field of 16 selections. Use the ROLL key for quickest access to the packet types needed to set up a call; CNTL-ROLL for other packet types. Table 49-5 lists the selections and shows the bit sequence that will be transmitted for each selection.

Table 49-7 shows which of three fields will be displayed on the next line for each packet TYPE selection. Table 49-8 lists and defines further selections that result from various packet TYPE selections.

(d) More Data Bit. The M field is present only when DATA packet has been selected in the TYPE field (see Table 49-7). The default selection is 0.

(e) PR (Receive Sequence Count). This is a window field with two selections. AUTO is the default selection. If you select AUTO, then the P(R) sent will be the last good received P(S) incremented by 1. The received P(S) is good if it is received in sequence and in a block with a good block check. The COMSTATE II will not increment the P(R) count until a good P(S) is received.

NOTE: When AUTO is selected, a trigger action of PR/PS reset will reset the P(R) of the message to zero. The PS value will increment to one following a reset if SKIP is selected.

The alternative selection in the window is a data-entry field in which you may enter a numerical value for PR. For Modulo 8 packets, enter a 1-digit hexadecimal number (0 through 7). For Modulo 128 packets, enter a one or two digit hexadecimal number (0 through 7F).

The number entered will be sent each time the message is transmitted. If you select this field but don't enter a P(R), the default entry 0 (zero) will be sent. If a specific P(R) is sent using this selection, then that P(R) will be the next received P(S) that is expected.

(f) PS (Send Sequence Count). This is a window selection field with four selections: AUTO, LAST REC PR, SKIP, and a data-entry field. The default choice is AUTO. If you select AUTO, then the P(S) count will always increment by one with each frame sent unless the message is aborted.

If you select LAST REC PR, the COMSTATE II will send the value of the last P(R) that was received in sequence and in a block with a good block check. This can be used to respond to a REJECT.

SKIP forces P(S) errors by causing the P(S) count to increment by 2.

NOTE: When AUTO is selected, a Reset PR/PS trigger action will reset PS to zero. The PS value will increment to one following a reset if SKIP has been selected.

If you enter a numerical value for PS, that number will be sent each time. For Modulo 8 packets, enter a 1-digit hexadecimal number (0 through 7). For Modulo 128 packets, enter a one or two digit hexadecimal number (0 through 7F). The default value 0 (zero) will be sent if you select this field but do not enter a number. If a specific P(S) is sent, then the next P(S) will be that P(S) plus 1 when AUTO is used.

(g) Clear Request, Restart Request, and Reset Indication Selections. When any of these three packet types is selected, a cause byte can also be selected, and this can be complemented by an optional 14-byte diagnostic field. There are 13 cause byte selections for a Clear Request packet, eight for a Restart Request, and three for a Reset Indication. In each case, "OTHER" is one of the selections. This option allows a two digit hexadecimal entry for a user-defined cause. Refer to Table 49-8 for more information on Cause and Diagnostic selections.

(h) Diagnostic Packet. When Diagnostic is the packet type, a 2-byte data-entry field is available for a diagnostic code. This is followed by an optional 11-byte field for diagnostic explanation.

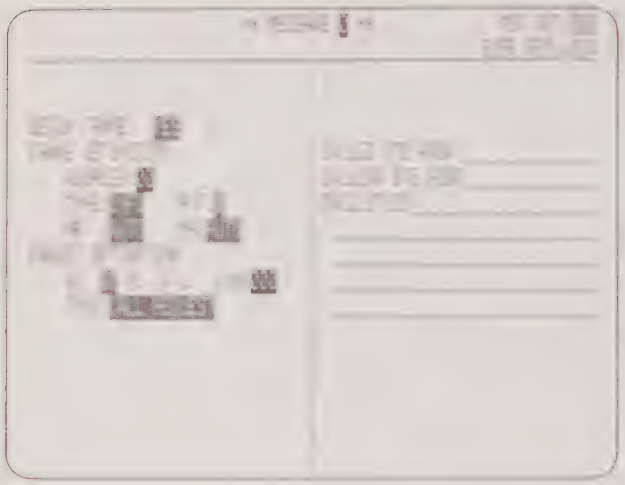

Figure 49-8

Figure 49-9

Address
Frame type
LCN
Packet type
Calling DTE address count
Calling DTE address
Called DTE address
Facilities count
0 0 1 0 0 7 1 3 5 7 8 9 0 1 0
0 0 0 0 F 8 2 4 6 8 9 0 1 0 A
FACILITIES
Called DTE address count
Last byte padded out with 0000
TW-926-015

Figure 49-10 Data transmitted by the COMSTATE II for CALL ACC entries shown in Figure 49-9 (Modulo 8 frame and packet sequencing).

(i) Call Request and Call Accept Selections. When either Call Request or Call Accept is selected in the packet TYPE window, three special fields replace the first three Text data-entry lines. These fields are CALLING DTE ADDR, CALLED DTE ADDR, and FACILITIES (see Figure 49-8).

Calling DTE Addr and Called DTE Addr are 16-character decimal fields; enter the addresses of the calling and called DTEs using decimal digits only (other keys are illegal in these two fields). The logic will then convert the two decimal addresses into packed-decimal (Binary-Coded Decimal, BCD) form and insert the correct count byte in accordance with the following algorithm.

The first decimal number entered in the Calling DTE Addr field will be encoded in the four high-order bits of the first Calling address byte to be sent; the second decimal number, in the four low-order digits of that byte; the third decimal number in the four high-order digits of the second byte, and so on. The Called DTE Addr will be encoded after the Calling address in the same fashion, but if the packed decimal Calling address ended with the four high-order binary bits, the Called address will utilize the low-order bits of that byte. If the Called address ends with the high-order portion of a byte, the low-order half of the byte will be packed with 0000. The logic will compute the counts for the Calling Addr digits and for the Called Address digits and pack them into a byte to be transmitted before the packed addresses, with the Calling Address count in the high-order bits and the Called Address count in the low-order bits.

(j) FACILITIES is a 22-byte alphanumeric field. The COMSTATE II sends a FACILITIES count byte after the Called DTE Address, followed by the data in the Facilities field, which is transmitted as ordinary data.

Figure 49-10 shows the data that would be transmitted for the menu entries shown in Figure 49-9 (Modulo 8 frame and packet sequencing).

> NOTE: If no text is entered in one (or more) of these fields, nothing will be transmitted for that field except the count byte (or half-byte) for that field, which will be 0.

49.9 TEXT FIELD

Up to three lines of the text field may be replaced by special data-entry fields resulting from certain packet TYPE selections (see Table 49-8). Otherwise, the Text lines can be used according to the same instructions as for BISYNC or ASYNC format.

For SDLC, enter level-3 protocol bytes in the Text fields. (See Section 48 for SDLC-SNA frame structures and possible values.)

49.10 STORING PROGRAM PARAMETERS IN PROGRAM MODE

The INTERVIEW COMSTATE II can store a number of the program variables used for interactive testing of X.25 and SDLC networks. This makes it possible to perform a series of tests -- using the LOAD PROGRAM trigger action, for example -- without having to reestablish a logical session between successive tests. To do this, select MAINTAIN for the Parameter 4 menu selection Lead Status Exiting Run. When the COMSTATE II exits Run Mode, all parameters to which the Maintain selection applies will be stored. When it reenters Run Mode, the test program will initialize, counters and timers will reset, and CRT enhancements will be turned off, but the stored parameters will remain in effect.

The following are the parameters that will be stored when Maintain is selected:

- voltage levels of the static leads controlled by the COMSTATE II;
- the values of N(S) and N(R) (see Section 49.6);
- the Transmit Variables;
- values of P(R) and P(S) for up to six logical channels (the Active LCN List; see Sections 49.8 and 49.11);
- status of the sixteen trigger flags (Sections 20.15 and 21.5).

Storing these parameters greatly increases the programming capacity of the COMSTATE II. You can write several programs to perform numerous tests. Use the flags for the same functions in all the programs. When one test is completed, enter Program Mode, load the next program into the INTERVIEW, and continue testing by reentering Run Mode. The unit will resume transmitting, starting with the current values of the stored parameters.

NOTE: The COMSTATE II will maintain TD and RD as shown in Table 49-1.

49.11 ACTIVE LOGICAL CHANNEL NUMBER LIST

For BSC/X.25 and 7E/X.25, the COMSTATE II can keep track of Receive and Send Sequence Counts for up to six logical channels. The manner in which LCNs become active is described below.

(a) Run Mode. When the COMSTATE II is in Run Mode, it compiles an internal table of active LCNs. The first LCNs to be added to the internal table are those designated by number in a trigger-actions menu LCN field (either for a Transmit or a Reset PR/PS action), on a message menu that is referenced in a trigger-actions TEXT field, or in the LCN field for a PS Rec Error on a trigger Conditions menu. LCNs are assigned to the active list in accordance with the rules for processing triggers explained in Section 25. If triggers are configured to send a seventh LCN, it will not be added to internal LCN tables, and the test may not run correctly.

If less than six LCNs are designated as transmit channels in the test, additional LCNs (up to a total of six) will be added to the internal table in the order received when the test is run.

(b) Program Mode. If RESET is selected for Lead Status Exiting Run on the Parameter 4 menu, the active LCN list will be cleared whenever the unit returns to Program Mode or whenever a new program is loaded.

If MAINTAIN is selected for Lead Status Exiting Run on the Parameter 4 menu, LCNs listed on the Parameter C menu can be kept. (See Figure 49-11.) (That is, their sequence numbers will be stored when the Program key is pressed or when another program is loaded.) If no entries are made on the Parameter C menu, sequencing for any LCN entered in any message menu will be retained.

If there are fewer than six LCNs entered on the Parameter C menu, additional LCNs (up to a total of six) may be kept. These LCNs must also be designated by number as a transmit channel, a Reset PR/PS channel, or a channel specified for a PS Rec Error condition. They are added in the order received in the test.

To insure that an LCN will remain active, select MAINTAIN on the Parameter 4 menu before running the test and add the LCN to the Active LCN List on Parameter C. If additional LCNs become active during the test, they may be added to the Parameter C list in Program Mode and maintained when the RUN key is pressed again.

NOTE: Channels which became active through LCN loopback must be manually added to the Parameter C list if their sequence counts are to be maintained. Sequence counts are not maintained for loopback channels when programs are chained automatically using the LOAD PROGRAM action.

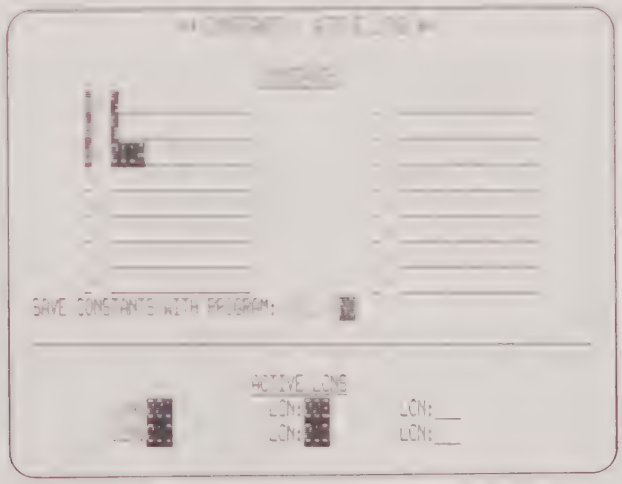

Figure 49-11

49.12 SPECIAL TRIGGER SELECTIONS

(a) Outstanding Frame Condition. For the Emulate Modes, this selection (Figure 49-12) appears on the trigger Conditions menus when BSC/X.25, 7E/X.25, SDLC, or SDLC/NRZI has been selected on the Parameter 1 menu. The default choice is NO. Select YES if you want a trigger action whenever there is an outstanding frame.

When the COMSTATE II transmits an information frame in X.25 or SDLC mode, the internal outstanding frame flag is set until that frame is acknowledged. Once the frame is acknowledged, the outstanding frame flag is reset. OUTSTANDING FRAME must be used with another condition that selects when it is to be tested -- usually a string search or timeout. For instance, you could set a timeout to start when a frame is transmitted and set a trigger to resend the frame if there is an outstanding receive frame at timeout.

NOTE: A Reset NR/NS action will reset an Outstanding Frame condition so that the next anticipated NR is zero.

(b) NS Rec Error. This field (Figure 49-12) appears on the trigger Conditions menus only for BSC/X.25, 7E/X.25, SDLC, and SDLC/NRZI in the Emulate Modes. It is true when the Number Sent Count Received does not equal the Number Sent Count Expected. The default choice is NO.

In X.25 and SDLC modes, the COMSTATE II is constantly monitoring the received N(S) count, which should always increment by 1. If the Received N(S) count sequence is, for example, 0, 1, 2, 4, 5, then this trigger condition will be true when the frame with N(S) 4 is received. This condition can be used to send a REJ frame.

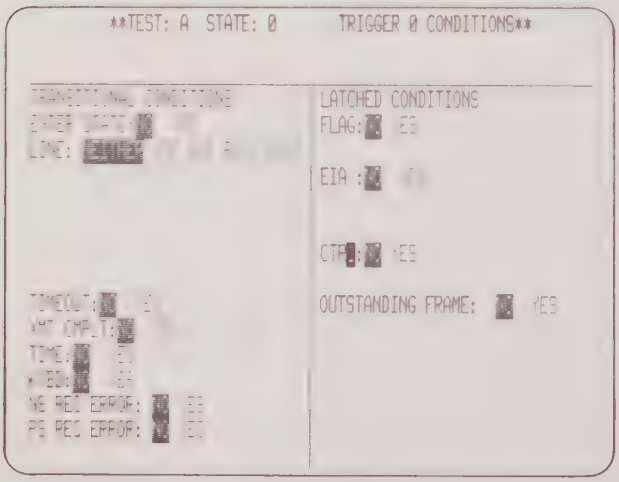

Figure 49-12

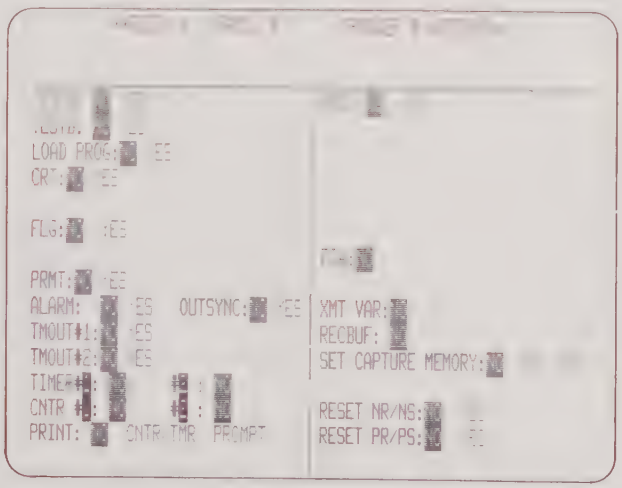

Figure 49-13

NOTE: A block is not considered received until the entire frame is received with a good BCC. Thus, if the Received N(S) count sequence is 0, 1, 2, 3, 4, but frame 2 is received with a bad BCC, this condition will be true when frame 3 is received with a good BCC.

(c) PS Rec Error. This field (Figure 49-12) is displayed on the trigger conditions menu for BSC/X.25 or 7E/X.25 in Emulate Modes. The logic monitors for this condition using the same rules as for NS received is not NS expected. For this condition also, a packet is not considered received until the entire frame is received with a good BCC.

When YES is selected for this condition, a three-digit LCN field comes up. Enter the three-digit hexadecimal LCN (without the HEX key). If no LCN is entered, the logic will look for an error on the last LCN received.

(d) RESET NR/NS Action. Frame sequence numbers, N(R) and N(S) can be reset to zero at any time by a trigger action. (See Figure 49-13.) For a full description of this action, refer to Section 42.7.

(e) RESET PR/PS Action. Packet sequence numbers can be reset to zero in response to a trigger at any time. (See Figure 49-13.) For a description of this trigger action and its use, refer to Section 42.8.

(f) Transmit Variable Action. The COMSTATE II has four Variable Counters that are controlled by the trigger Xmt Var action. (See Figure 49-13.) See Section 42.6 for instructions on how to include the output of these counters in a transmission.

49.13 MODULO 128 OPERATIONS

Special selections on the Parameter 1 menu allow you to choose X.25 frame sequencing (Modulo 8 or 128) or packet sequencing (Modulo 8 or 128). In addition, extended frame addressing (2-3 bytes) can be selected on the Parameter 1 menu. All features available with X.25 Modulo 8 function with X.25 Modulo 128.

The COMSTATE II supports X.25 Modulo 128 as well as X.75 Modulo 128 in accordance with 1984 CCITT standards. Users who wish to use the COMSTATE II to analyze versions of X.75 which preceded the 1984 standards may do so, keeping in mind the following stipulations:

(1) Automatic frame selections may be used to transmit unnumbered frames; however, the value of the second control byte must be specified in the TEXT field on the Trigger Actions menu or on the message menu. (The P/F bit is represented in the right-most position.)

(2) Automatic Frame selections on trigger Conditions menus can be used for all X.75 frames; however, the value of the P/F bit cannot be specified, unless the frame is entered as a STRING.

(3) P/F value on the X.25 Frame Trace display will not be valid for unnumbered frames. Nor is the P/F bit expansion valid in Freeze Mode.

(4) P/F loopback capability is not available for unnumbered frames.

49.14 FRAME ADDRESS SELECTIONS

The FRAME ADDR LENGTH selection on the Parameter 1 menu makes available three address lengths: one, two, or three bytes. The selection made on the Parameter 1 menu determines how the COMSTATE II interprets header information in received frames. It also determines how many bytes of address information the COMSTATE II will transmit. Be certain that this selection is consistent with the type of frame addressing actually used in tested data.

Frame addresses are entered in the same way on Trigger Conditions, Trigger Actions, and Message menus. In the appropriate ADDR field, enter two characters for each hexadecimal byte of the frame address.

If there is no entry in the ADDR field of a Trigger Conditions menu, the string search will accept any address. If no frame address is entered in a Message or Trigger Actions menu, the COMSTATE II will transmit all zeros in the address bytes.

The COMSTATE II interprets address entries as follows when the data supplied by the operator is shorter than anticipated: The right-most character in the ADDR field becomes the four low-order bits of the address being sought or transmitted. The next entry to the left in the ADDR field becomes the four high-order bits of the same address byte. Additional entries are incorporated in the address from right to left (see Figure 49-13). Where hexadecimal values are expected but have not been entered, the frame address being sought or transmitted is padded out to the left with zeros.

When the data entered in an ADDR field exceeds the expected address length, the COMSTATE II fills in the address starting from the right and truncates any extra characters to the left (see Figure 49-14).

FRAME ADDR LENGTH: 3
(Parameter 1)

ADDR 1 2 3

Xmitted Address: $0_0 0_1 2_2 3_3$

TW-926-271

Figure 49-13 Frame address entered is shorter than expected.

FRAME ADDR LENGTH: 2
(Parameter 1)

ADDR 1 2 3 4 5 6

Xmitted Address: $3_4 5_5 6_6$

TW-926-270

Figure 49-14 Frame address entered is longer than expected.

TABLE 49-2
FRAME-TYPE SELECTIONS IN XMIT FIELDS AND ON MESSAGE-ENTRY MENUS

TYPE Selection	Definition	Bit Pattern 8	7	6	5	4	3	2	1
USE ROLL KEY TO START HERE									
INFO	INFOrmation	X	X	X	P	X	X	X	0
RR	Receiver Ready	X	X	X	P/F	0	0	0	1
RNR	Receiver Not Ready	X	X	X	P/F	0	1	0	1
REJ	REJect	X	X	X	P/F	1	0	0	1
SREJ	Selective REJect	X	X	X	P/F	1	1	0	1
SARM/DM	Set Asynchronous Response Mode/ Disconnect Mode	0	0	0	F	1	1	1	1
SABM	Set Asynchronous Balanced Mode	0	0	1	P	1	1	1	1
DISC/RD	DISConnect/ Request Disconnect	0	1	0	P	0	0	1	1
UA	Unnumbered Acknowledgment	0	1	1	F	0	0	1	1
FRMR	FRaMe Reject	1	0	0	F	0	1	1	1
TEST	link TEST	1	1	1	P/F	0	0	1	1
XID	eXchange station ID	1	0	1	P/F	1	1	1	1
SNRM	Set Normal Response Mode	1	0	0	P/F	0	0	1	1
UI	Unnumbered Information	0	0	0	P/F	0	0	1	1
SIM/RIM	Set Initialization Mode/ Request Initialization Mode	0	0	0	P/F	0	1	1	1
UP	Unnumbered Poll	0	0	1	P	0	0	1	1
CFGR	CoNFIGuRe	1	1	0	P/F	0	1	1	1
BCN	BeaCoN	1	1	1	F	1	1	1	1
SABME	Set Asynchronous Balance Mode, Extended	0	1	1	X	1	1	1	1
SI0	Sequenced Information 0	0	1	1	P/F	0	1	1	1
SI1	Sequenced Information 1	1	1	1	P/F	0	1	1	1
OTHER 00	User-defined frame type	Overwrite 00 to enter hex equivalent of bit pattern.							
USE CTRL-ROLL TO START HERE									

Note 1: X represents sequence numbers in Info and Supervisory Frames. X represents "Undefined" in SABME frames.

TABLE 49-3
XMIT SELECTIONS AND CONTROL BYTES FOR
X.25 MODULO 128 SEQUENCED FRAMES (1)

TYPE Selection	Definition	Bit Pattern First transmitted Octet 8 7 6 5 4 3 2 1		Second transmitted Octet 8 7 6 5 4 3 2 1	
INFO	INFOrmation	N(S)	0	N(R)	P
RR	Receiver Ready	0 0 0 0 0 0 0 1		N(R)	P/F
RNR	Receiver Not Ready	0 0 0 0 0 1 0 1		N(R)	P/F
REJ	REJect	0 0 0 0 1 0 0 1		N(R)	P/F
SREJ	Selective REJect	0 0 0 0 1 1 0 1		N(R)	P/F

Note 1: For control bytes transmitted in all other frames, see Table 49-2.

TABLE 49-4
SELECTIONS ENABLED BY FRAME-TYPE SELECTIONS ON MESSAGE-ENTRY MENUS

Frame Type	NR	P/F	NS
INFO	AUTO, 0	0, 1, LPBK	AUTO, LAST REC NR, SKIP, 0
RR	AUTO, 0	0, 1, LPBK	--
RNR	AUTO, 0	0, 1, LPBK	--
REJ	AUTO, 0	0, 1, LPBK	--
SREJ	AUTO, 0	0, 1, LPBK	--
SARM/DM	--	0, 1, LPBK	--
SABM	--	0, 1, LPBK	--
DISC/RD	--	0, 1, LPBK	--
UA	--	0, 1, LPBK	--
FRMR	--	0, 1, LPBK	--
TEST	--	0, 1, LPBK	--
XID	--	0, 1, LPBK	--
SNRM	--	0, 1, LPBK	--
UI	--	0, 1, LPBK	--
SIM/RIM	--	0, 1, LPBK	--
UP	--	0, 1, LPBK	--
CFGR	--	0, 1, LPBK	--
BCN	--	0, 1, LPBK	--
SABME	--	0, 1, LPBK	--
SIO	--	0, 1, LPBK	--
SI1	--	0, 1, LPBK	--
OTHER 00	--	--	--

TABLE 49-5
PACKET-TYPE SELECTIONS IN XMIT FIELDS AND ON MESSAGE-ENTRY MENUS

TYPE Selection	Definition	Bit Pattern 8 7 6 5 4 3 2 1
USE ROLL KEY TO START HERE		
DATA	DATA	X X X M X X X 0
RR	Receiver Ready	X X X 0 0 0 0 1
RNR	Receiver Not Ready	X X X 0 0 1 0 1
REJECT	REJECT	X X X 0 1 0 0 1
INTERRUPT	INTERRUPT	0 0 1 0 0 0 1 1
INT CONF	INTerrupt CONFirm	0 0 1 0 0 1 1 1
DIAGNOSTIC	DIAGNOSTIC	1 1 1 1 0 0 0 1
OTHER 00	User-defined frame type	Enter hexadecimal equivalent of bit pattern desired by writing over 00
RESTART CONF	RESTART CONFirm	1 1 1 1 1 1 1 1
RESTART REQ	RESTART REQuest	1 1 1 1 1 0 1 1
RESET CONF	RESET CONFirm	0 0 0 1 1 1 1 1
RESET IND	RESET INDication	0 0 0 1 1 0 1 1
CLEAR CONF	CLEAR CONFirm	0 0 0 1 0 1 1 1
CLEAR REQ	CLEAR REQuest	0 0 0 1 0 0 1 1
CALL ACC	CALL ACCept	0 0 0 0 1 1 1 1
CALL REQUEST	CALL REQUEST	0 0 0 0 1 0 1 1
NO PAKT	NO PACKET	NO Packet Type Identifier included in frame. TEXT field can be used, however.
USE CTRL-ROLL TO START HERE		

TABLE 49-6
XMIT SELECTIONS AND BIT PATTERNS
FOR X.25 MODULO 128 SEQUENCED PACKETS (1)

TYPE Selection	Definition	Bit Pattern Octet 3 8 7 6 5 4 3 2 1	Octet 4 8 7 6 5 4 3 2 1
DATA	DATA	P(S) 0	P(R) M
RR	Receiver Ready	0 0 0 0 0 0 0 1	P(R) 0
RNR	Receiver Not Ready	0 0 0 0 0 1 0 1	P(R) 0
REJ	REJect	0 0 0 0 1 0 0 1	P(R) 0
SREJ	Selective REJect	0 0 0 0 1 1 0 1	P(R) 0

Note 1: For Transmitted Bit Patterns of all other packet types, see Table 49-5.

TABLE 49-7
SELECTIONS ENABLED BY PACKET-TYPE SELECTIONS ON MESSAGE-ENTRY MENUS

Packet Type	PR	M	PS
DATA	AUTO, 0	0, 1	AUTO, LAST REC PR, SKIP, 0
RR	AUTO, 0	--	--
RNR	AUTO, 0	--	--
REJECT	AUTO, 0	--	--
INTERRUPT	--	--	--
INT CONF	--	--	--
DIAGNOSTIC (See Note 1.)	--	--	--
OTHER 00	--	--	Enter hexadecimal equivalent of bit pattern desired by writing over 00.
RESTART CONF	--	--	--
RESTART REQ (See Note 1.)	--	--	--
RESET CONF	--	--	--
RESET IND (See Note 1.)	--	--	--
CLEAR CONF	--	--	--
CLEAR REQ (See Note 1.)	--	--	--
CALL ACC (See Note 1.)	--	--	--
CALL REQUEST (See Note 1.)	--	--	--
NO PACKET	--	--	--

NOTE 1: When this packet TYPE is selected, a list of selections for the following byte or bytes is presented. See Table 49-8 for a list of these selections.

TABLE 49-8
SELECTIONS FOR BYTES FOLLOWING PACKET-TYPE IDENTIFIER ON MESSAGE-ENTRY MENUS

Packet Type	Ensuing Selection	Data Sent by COMSTATE II	Notes
DIAGNOSTIC	DIAG CODE	2-byte data-entry field	Sent following packet-type identifier.
	DIAG EXPL	11-byte data-entry field	Sent following packet-type identifier
RESTART REQ	CAUSE BYTE		
	NETWORK CONGESTION	0000 0001	Sent following packet-type identifier.
	NETWORK OPERATIONAL	0000 0011	Sent following packet-type identifier.
	OTHER 00	Two-digit hexadecimal field	Sent following packet-type identifier.
	DIAGNOSTIC	14-byte data-entry field	Sent following RESTART REQuest cause byte.

(continued)

TABLE 49-8 (continued)

Packet Type	Ensuing Selection	Data Sent by COMSTATE II	Notes
RESET IND	CAUSE BYTE		
	OUT OF ORDER	0000 0001	Sent following packet-type identifier.
	REMOTE PROCEDURE ERROR	0000 0011	Sent following packet-type identifier.
	LOCAL PROCEDURE ERROR	0000 0101	Sent following packet-type identifier.
	NETWORK CONGESTION	0000 0111	Sent following packet-type identifier.
	REMOTE DTE OPERATIONAL	0000 1001	Sent following packet-type identifier.
	NETWORK OPERATIONAL	0000 1111	Sent following packet-type identifier.
	INCOMPATIBLE DESTINATION	0001 0001	Sent following packet-type identifier.
	OTHER 00	Two-digit hexadecimal field	Sent following packet-type identifier.
	DIAGNOSTIC	14-byte data-entry field	Sent following the RESET INDication CAUSE byte.

(continued)

TABLE 49-8 (continued)

Packet Type	Ensuing Selection	Data Sent by COMSTATE 11	Notes
CLEAR REQ	CAUSE BYTE		
	NUMBER BUSY	0000 0001	Sent following packet-type identifier.
	OUT OF ORDER	0000 1001	Sent following packet-type identifier.
	REMOTE PROCEDURE ERROR	0001 0001	Sent following packet-type identifier.
	REVERSE CHARGE NOT ACCEPTED	0001 1001	Sent following packet-type identifier.
	INCOMPATIBLE DESTINATION	0010 0001	Sent following packet-type identifier.
	FAST SELECT NOT ACCEPTED	0010 1001	Sent following packet-type identifier.
	INVALID FACILITY REQUEST	0000 0011	Sent following packet-type identifier.
	ACCESS BARRED	0000 1011	Sent following packet-type identifier.
	LOCAL PROCEDURE ERROR	0001 0011	Sent following packet-type identifer.
	NETWORK CONGESTION	0000 0101	Sent following packet-type identifier.
	NOT OBTAINABLE	0000 1101	Sent following packet-type identifier.

(continued)

TABLE 49-8 (continued)

Packet Type	Ensuing Selection	Data Sent by COMSTATE II	Notes
CLEAR REQ (cont.)	RPOA OUT OF ORDER	0001 0101	Sent following packet-type identifier.
	OTHER 00	Two-digit hexadecimal field	Sent following packet-type identifier.
	DIAGNOSTIC	14-byte data-entry field	Sent following the CLEAR REQuest CAUSE byte.
CALL ACC	CALLING DTE ADDR	16-byte decimal addr. field	Packs the decimal entry and computes count. See text, Section 49.8I
	CALLED DTE ADDR	16-byte decimal addr. field	Packs decimal entry and computes count. See text, Section 49.8I
	FACILITIES	22-byte alphanumeric field	Computes count. Sent following Calling/Called DTE address. See Section 49.8J
CALL REQUEST	CALLING DTE ADDR	16-byte decimal address field	Packs the decimal entry and computes count. See text, Section 49.8I
	CALLED DTE ADDR	16-byte decimal address field	Packs decimal entry and computes count. See text, Section 49.8I
	FACILITIES	22-byte alphanumeric field	Computes count. Sent following Calling/Called DTE address. See text, Section 49.8J

50 REMOTE TRANSFER

TABLE 50-1
COMSTATE II REMOTE TRANSFER CAPABILITIES

COMSTATE II SENDS TO OR RECEIVES FROM	TYPE OF INFORMATION TRANSFERRED (Note 1)			
COMSTATE II	Setup	Test	Taped data	CRT-data
4600	Setup (Note 2)	Test (Note 2)	Taped data	CRT-data
4500 with Remote Transfer	Setup (Note 2)	Test (Note 2)	Taped data	CRT-data
3900 with Remote Transfer	Setup (Note 2)	Test (Note 2)	Taped data	CRT-data
3600 with Remote Transfer	Setup (Note 2)	Test (Note 2)	Taped data	CRT-data
COMSTATE I	Setup (Note 2)	Test (Note 2)	---	CRT-data
INTERVIEW 30B/40B with Remote Transfer	Setup (Note 2)	Test (Note 2)	---	CRT-data
20R	---	Test (Note 2)	Taped data	---

Note 1: Setup = Parameter 1, 2, and 9 menus
(Programs 0 and B for COMSTATE I and 30B/40B devices)
Test = All menus and triggers

Note 2: COMSTATE II setups or tests cannot be loaded into other INTERVIEW units. Programs specific to the units can be stored on tape in the COMSTATE II and later transferred to like units. Once on tape in the COMSTATE II, programs from a 4600 or 4500 can be loaded into the COMSTATE II. Tests and setups from other types of units cannot be loaded directly into the memory of the COMSTATE II.

50
REMOTE TRANSFER

50.1 REMOTE TRANSFER CAPABILITIES

The COMSTATE II can transfer information to or receive it from a remote member of the INTERVIEW family if the remote INTERVIEW also has Remote Transfer capability. These Remote Transfers are established on the Remote Transfer menu of the COMSTATE II (Parameter 8; Figure 50-1). They employ the Printer/Remote interface on the rear panel of the COMSTATE II and can be conducted either through modems or via a direct cable. The transfers may not be remotely controlled in all cases: an operator may be required at both the sending and receiving device.

Table 50-1 specifies the devices with which the COMSTATE II can do Remote Transfers and the types of information that can be transferred.

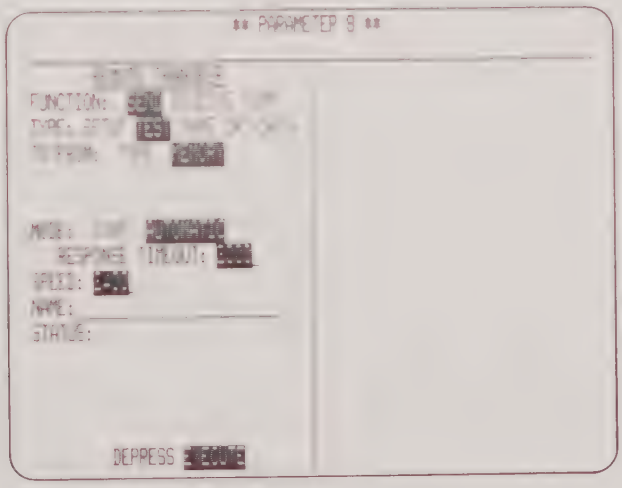

Figure 50-1

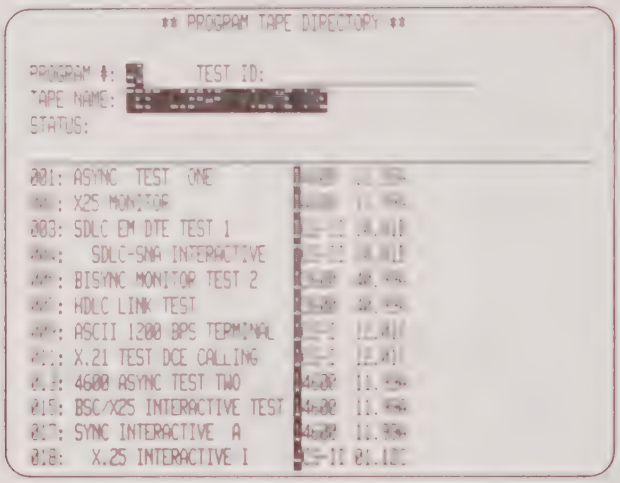

Figure 50-2 Program Tape Directory

50.1.1 Taped Data

In Remote Transfer Mode, the COMSTATE II can send line data stored on its tape to certain other INTERVIEWs or receive and record on its own tape line data from these same INTERVIEWs (see Table 50-1).

50.1.2 Setups and Tests

The COMSTATE II can transfer tests or setups from its internal memory to the internal memory of another COMSTATE II. ("Setup" refers to the configuration of Parameter 1, 2, and 9 menus only; "test" designates the configuration of all menus.)

50.1.3 CRT Data

With Software Version 10.02 or above, the COMSTATE II can send or receive CRT data to or from other INTERVIEW units with compatible transfer capabilities. These include certain COMSTATE II, 4600, 3600, COMSTATE I, 30B, and 40B units. CRT data transfers are described in Section 50.3.5.

50.1.4 Transfer Modes

The COMSTATE II transfers data in one of two modes: automatic or dump. When it is in the automatic mode, the COMSTATE II requests and waits for acknowledgments from the remote device during transfer. When it is dumping, the COMSTATE II does not request or wait for acknowledgments; the information is transmitted immediately whether or not the remote device is ready to receive the transfer.

50.1.5 Remote Transfer Enhancements

If Software Version 10.02 or above is installed in the COMSTATE II, remote transfer capabilities are enhanced.

The COMSTATE II can receive Tests from certain other INTERVIEW devices (20R, 30B, 40B, COMSTATE I, 3600, 3900, 4500, and 4600) and store them on a Program Only tape. From the tape, the tests can later be loaded into a compatible unit.

> NOTE: Neither a COMSTATE II test nor a COMSTATE II setup can be loaded into the memory of another type of INTERVIEW.

Tests or setups received from other INTERVIEW units are stored on tapes with an improved directory format. The programs are listed on the Program Tape Directory by name and tape location. Device type, software version installed in the original device, and number of blocks are also given in the directory. (See Figure 50-2). Refer to Section 36 for further information on the Program Tape Directory and its use.

With Software Version 10.02 or above, any COMSTATE II programs can be loaded and run, no matter whether the Software Version of the program is older or more recent than the software installed in the COMSTATE II. In addition, 4500 and 4600 programs of any software version can be loaded from tape and run in the COMSTATE II. This procedure is described in Section 36.7.

This level of software also renders the COMSTATE II capable of sending CRT data (either from tape or directly from the screen buffer) to another INTERVIEW with the same remote transfer capabilities (see Section 50.3.5). The COMSTATE II can receive CRT data from another INTERVIEW, store the data on tape, and later reanalyze it. CRT data capture and reanalysis are discussed further in Sections 34 and 11.

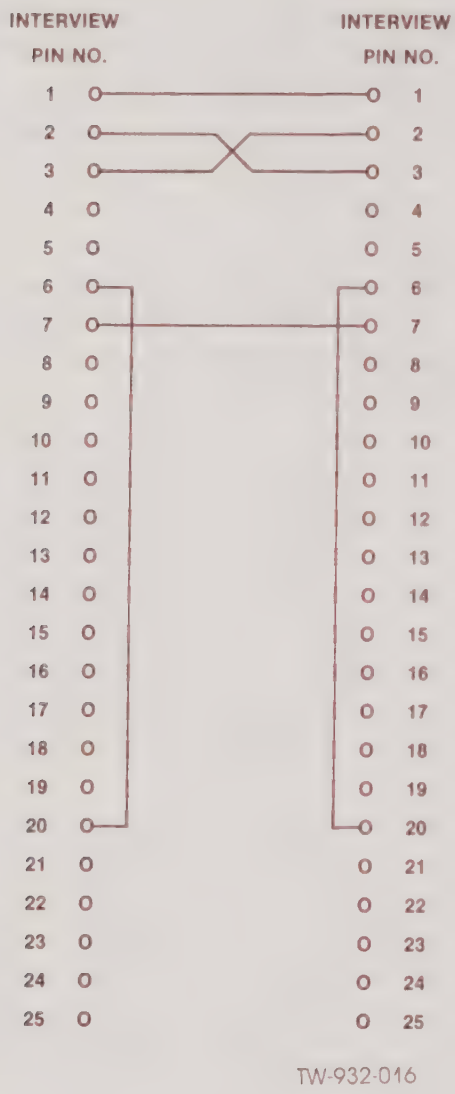

Figure 50-3 INTERVIEW-to-INTERVIEW Cable wiring diagram

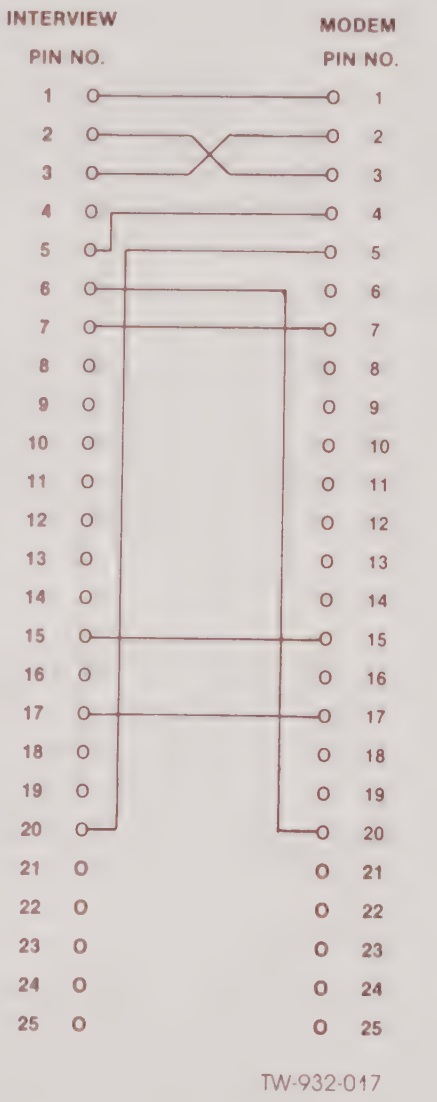

Figure 50-4 INTERVIEW-to-Modem Cable wiring diagram.

50.2 HARDWARE CONFIGURATION

50.2.1 Printer/Remote Interface

COMSTATE II sends and receives remote transfers through the Printer/Remote interface. This interface on the rear panel of the INTERVIEW COMSTATE II or other INTERVIEW device always appears as a modem. DSR and RLSD are constantly driven ON. When the INTERVIEW is performing a Remote Transfer SEND function, it transmits on Pin 3 (RD) of the Printer/Remote connector. If it is performing the RECEIVE function, it expects to receive on Pin 2 (TD) of that connector.

NOTE: When the Printer/Remote interface is used to send information to a printer, the Printer Control menu (Parameter 3) must be filled in. Refer to Section 38 for an explanation of this menu.

50.2.2 Cables

Because the Printer/Remote interface appears as a modem, special cables must be used for the Remote Transfer functions to make the COMSTATE II appear as a terminal. The cables used are the INTERVIEW-TO-INTERVIEW cable and the INTERVIEW-to-Modem cable. Wiring diagrams for each are shown in Figures 50-3 and 50-4. Cable configurations for typical applications are discussed in the sections which follow.

50.2.3 Transfers between the COMSTATE II and Similar Devices

For a remote transfer between the COMSTATE II and a similar INTERVIEW device with remote transfer capabilities, such as another COMSTATE II or an INTERVIEW 3600, 3900, 4500, 4600, 30B, 40B, or a COMSTATE I, two standard cable configurations are used, depending on whether the connection is direct or via modems.

Figures 50-5 and 50-6 illustrate the cabling requirements for the COMSTATE II to send and receive information in automatic or dump mode.

When transferring directly between one COMSTATE II and another COMSTATE II or between a COMSTATE II and one of the INTERVIEW devices mentioned above, use the INTERVIEW-to-INTERVIEW cable. Connect this cable between the two Printer/Remote connectors.

When transferring between the COMSTATE II and any of these units via modems, use the INTERVIEW-to-Modem cable (Figure 50-6) between each INTERVIEW and its modem.

NOTE: The INTERVIEW-to-Modem cable can be connected in only one direction. Be sure to connect the end labeled INTERVIEW to the INTERVIEW's Printer/Remote connector, and the end labeled MODEM to the modem.

50.2.4 Remote Transfer with an INTERVIEW 20'

In transfers via modem between a COMSTATE II and an INTERVIEW 20R (in automatic or dump mode), the COMSTATE II connects to its modem with an INTERVIEW-to-Modem cable, and the 20R connects to its modem with an RS-232/V.24 cable (see Figure 50-7).

For direct transfer between the COMSTATE II and the INTERVIEW 20R, a Modem-Eliminator Cable must be used between these two cables (see Figure 50-8). (Modem-Eliminator cables can be identified in the ARC Teleproducts Price List by "ME" in the model number.)

In all cases, the cables are connected to the Printer/Remote interface of each device.

Figure 50-5 Remote Transfer in Automatic or Dump Mode for devices shown. Cable is connected to the Printer/Remote connector of each INTERVIEW.

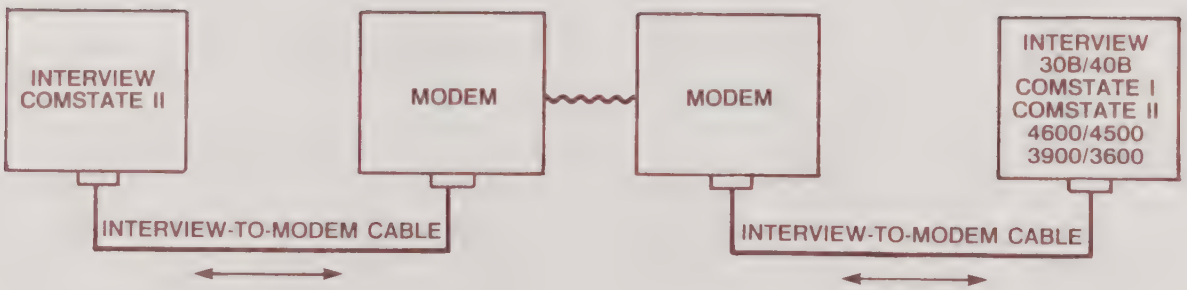

Figure 50-6 Remote Transfer via modem between COMSTATE II and devices shown. INTERVIEW-to-Modem cables are connected to the Printer/Remote interface of each device.

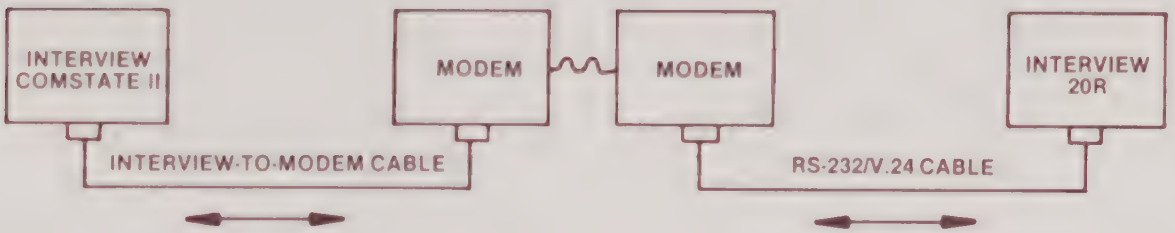

Figure 50-7 Remote Transfer between COMSTATE II and INTERVIEW 20R, in Automatic or Dump Mode. Cables are connected to the Printer/Remote connector of each device.

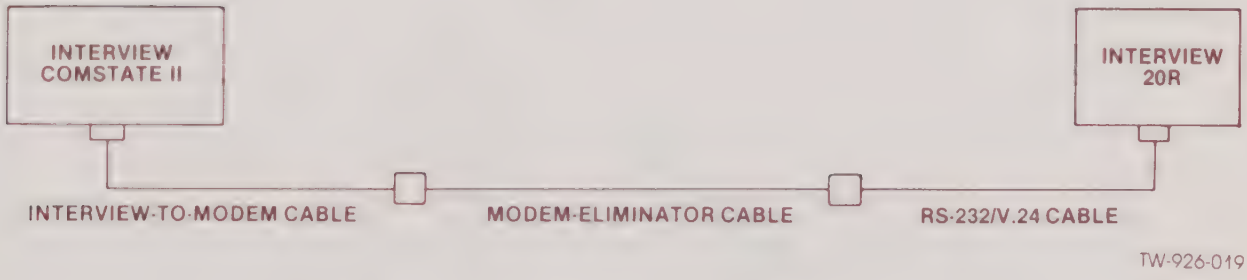

Figure 50-8 Remote Transfer between the COMSTATE II and the INTERVIEW 20R. A Modem Eliminator cable must be used when the two units are connected directly.

Prepare the COMSTATE II for transfer according to the procedure in Section 50.3 (for automatic transfer) or Section 50.4 (for dump transfer). Establish remote transfer parameters on the INTERVIEW 20R (Step 11). Indicate whether the unit is to send or receive. Specify TAPE as the recording medium. Indicate whether the transfer is to be performed in automatic or dump mode. Set the INTernal clock to match the speed selected on the COMSTATE II. Recommended maximum speed between the COMSTATE II and the INTERVIEW 20R is 9600 bps.

50.3 REMOTE TRANSFER IN THE AUTOMATIC MODE

Transfer of information between the COMSTATE II and remote devices is most often performed in the Automatic mode.

In the Automatic mode the INTERVIEW conducts handshaking, then requests and waits for acknowledgments during the transmission. Information is transmitted in hexadecimal-encoded ASCII and is formatted using a BISYNC protocol subset, with error checking (7 bits, even parity, even LRC).

50.3.1 Line-Level Handshaking at the Modem in Automatic Mode

Before and during a remote transfer, the COMSTATE II conducts handshaking first at the physical line level, then at the protocol level. At the line level, when the XEQ key is pressed while SEND is selected on the Remote Transfer menu, RTS is turned on at the modem end of the cable (and TRANSMITTING appears on the screen) to indicate that the unit is ready to transmit. RTS will stay on until CTS is turned on at the modem.

When CTS ON is received, the protocol-level handshake (SY SY ENQ) is transmitted on Pin 2 at the modem end of the INTERVIEW-to-MODEM cable. This is followed if acknowledged by the first message block, encoded in hexadecimal ASCII. Between consecutive message blocks, RTS is again driven ON at the modem, and the COMSTATE II waits for CTS ON.

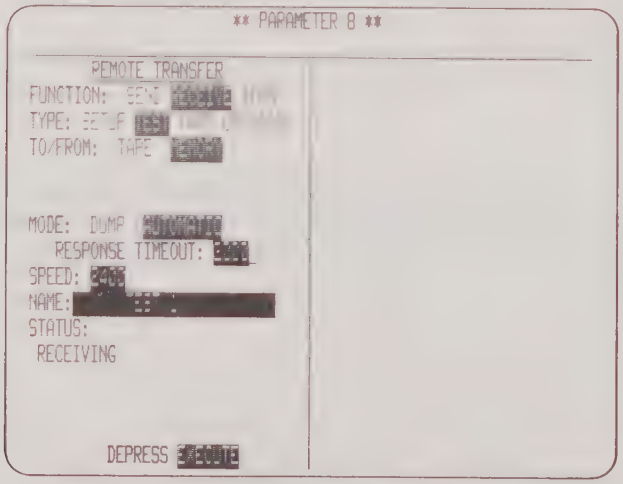

Figure 50-9 Receiving a Test in Automatic Mode.

50.3.2 Protocol-Level Handshaking in Automatic Mode

When transmitting in automatic mode, the COMSTATE II waits at the end of each message block for an ACK. If no ACK is received, the COMSTATE II sends an ENQ and waits for a response. If after five ENQs no ACK is received, the COMSTATE II displays NO RECEIVER RESPONSE and transmission is terminated.

The response time between blocks is 2 seconds (2000 milliseconds) by default. That is, the COMSTATE II waits up to 2 seconds for an ACK after each block it sends. This delay may be modified. The operator may enter any value from 1 millisecond to 6.5 seconds (entered as 6500 milliseconds) in the space provided (see Figure 50-9).

50.3.3 Transferring Setups or Tests

The COMSTATE II can transfer tests or setups directly from its memory to the memory of another COMSTATE II. It cannot perform internal-memory-to-internal-memory transfers with any other type of INTERVIEW.

The COMSTATE II can perform tape-to-tape, tape-to-memory, and memory-to-tape transfers with other kinds of INTERVIEWs, however. These transfers are also performed from the Parameter 8 menu.

> NOTE: The TO/FROM line which appears on the Parameter 8 menu always refers to the unit which displays the line. (That is, it always indicates "RECEIVE TO" or "SEND FROM").

The following procedures explain how to prepare the COMSTATE II to send or receive tests or setups in automatic mode. They apply to program transfers involving either memory or tape.

(a) Receiving Setups or Tests. On the Remote Transfer menu (Parameter 8) of the destination COMSTATE II, select

> FUNCTION: RECEIVE
> MODE: AUTOMATIC
> TYPE: TEST or SETUP
> TO: TAPE or MEMORY (if option is available)

If TAPE is selected, the test or setup will be stored on the program tape installed in the receiving unit, along with other information pertaining to the test or setup (see Figure 50-2).

> NOTE: Be sure a program to be received to tape has been named prior to the transfer. If no name is assigned to the test or setup, it will be transferred, but the COMSTATE II will consider the initial block of the program to be available for programs subsequently received. No name or program information will appear on the Program Tape Directory. As a result, the unnamed program is likely to be overwritten.

The START AT BLOCK which appears when TAPE is selected must be filled in. Enter the number of the tape block at which the program is to be stored. (The number of the next available block appears on the top line of the Program Tape Directory.)

Enter the RESPONSE TIMEOUT in milliseconds (refer to Section 50.3.2).

Enter the SPEED (in bits per second) at which the transfer is to proceed. The default value is 2400; the maximum recommended speed is 9600. Press the XEQ key. The message RECEIVING will blink, indicating that the unit is ready to receive either a test or setup at the Printer/Remote connector. (See Figure 50-9.)

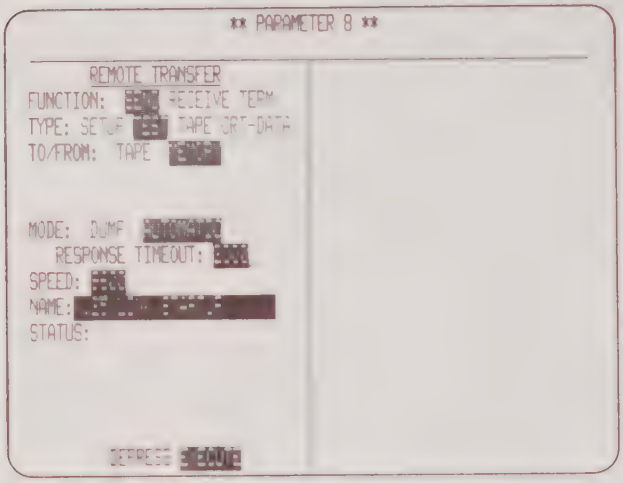

Figure 50-10 Sending a Test in Automatic Mode.

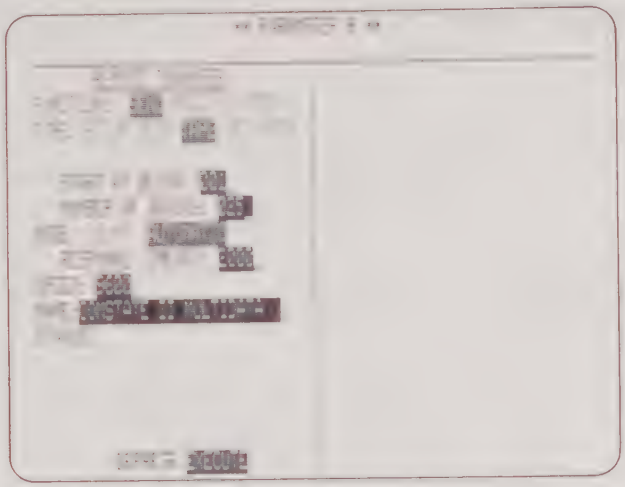

Figure 50-11 Sending data from the data tape. Enter tape block numbers to identify the data to be sent.

(b) Sending Setups or Tests. To send information from the COMSTATE II, select FUNCTION: SEND on the Parameter 8 menu of the source unit. In the TYPE field, select either --

(1) SETUP. Only the basic Setup configuration will be transferred, whether from tape or from memory. A 3600/4600/COMSTATE II setup includes Parameters 1, 2, and 9. A 30B/40B/COMSTATE I setup is comprised of Programs 0 and B.

(2) TEST. The configurations of all menus, including the Trigger, Statistics and Message-Entry menus, but excluding the Remote Transfer menu, will be transferred.

Select FROM: MEMORY or TAPE. (Default is MEMORY.) When TAPE is selected, indicate the first block of the program in the START AT BLOCK field. (The number of the first block appears highlighted just to the left of the program name on the Program Tape Directory.)

For MODE, on Line 7, select AUTOMATIC. On Line 8 enter a SPEED. Be sure that the speed is compatible with the speed of the modem or the destination unit, whichever is directly connected to the COMSTATE II.

In the NAME field (Line 9), you should enter a name for the program you are transmitting. Giving the program a name ensures that it will be correctly saved to tape in a receiving INTERVIEW. (See Note, Section 50.3.3 a.) This name will automatically be written on the NAME line in the destination unit. You may use up to 23 alphanumeric or control characters. Figure 50-10 shows the Remote Transfer menu ready to send a test.

Press the XEQ key. The message TRANSMITTING will blink, indicating that the COMSTATE II has initiated the handshaking routine.

When handshaking has been accomplished between the two INTERVIEWs, or with the modem, a decrementing hexadecimal number will appear at the right of the Status field in each unit. This is the number of bytes still to be sent or received. When the number reaches 00 00 (hex), the transfer is complete, and the STATUS messages on the source and destination units will change to TRANSMITTED and RECEIVED, respectively.

50.3.4 Transferring Taped Data

The COMSTATE II is capable of transferring line data stored on its data tape to other INTERVIEW recording devices (see Table 50-1). The procedure for transferring data in the automatic mode is very similar to that of transferring setups and tests.

> NOTE: Line data is distinct from CRT data. Section 50.3.5 outlines procedures for transferring CRT data.

(a) Sending Data. To send data from the COMSTATE II to another INTERVIEW, select FUNCTION: SEND and TYPE: TAPE on the Remote Transfer menu.

This displays the START AT BLOCK and NUMBER OF BLOCKS fields, which refer to the data blocks on the source tape (see Figure 50-11; for an explanation of data blocks, see Section 32.2). Enter the range of blocks that you wish to send from the COMSTATE II. The transfer will start at Block 000 if no starting position is given. If the number of blocks is not specified, only one block will be sent.

> NOTE: The tape in the destination unit should be formatted as a data tape prior to the transfer.

NOTE: If you specify a NUMBER OF BLOCKS larger than the number of blocks remaining on the tape, the tape will loop through Block 000. For instance, if there are 250 blocks of data on the tape and 40 blocks are specified to be sent starting from Block 230, the transmission will end with Block 20.

For MODE, select AUTOMATIC. Enter the RESPONSE TIMEOUT in milliseconds (refer to Section 50.3.2).

Next, enter a SPEED (in bits per second). Be sure that the speed is the same as that selected on the destination unit or the intervening modem. In the NAME field, you should enter a name for the data you are transmitting.

Press XEQ. A decrementing hexadecimal number should appear after the STATUS message TRANSMITTING. When the transmission is complete, the STATUS message will read TRANSMITTED.

NOTE: If the Remote Transfer menu specifies that more blocks are to be transferred than the actual number of blocks on the tape, the transfer will stop as soon as the last block on the tape has been sent. At the same time, the hexadecimal value representing the number of remaining blocks suddenly drops to zero. The message "XXX BLOCKS TRANSFERRED" gives an accurate count of blocks actually transferred.

(b) Receiving Data. To receive taped data from another INTERVIEW in the Automatic mode, select FUNCTION: RECEIVE and TYPE: TAPE. This displays the START AT BLOCK field. Enter the number of the block at which recording is to begin. Recording will begin at BLOCK 000 by default.

NOTE: A formatted Program Data tape must be used to receive data. Refer to Section 32.5 for an explanation of the formatting procedure.

NOTE: In receive mode the data tape will not loop to the beginning of the tape. When the end of the tape is reached, the message END OF CAPTURE MEMORY is displayed on the Status Line and further transmission is aborted.

Select AUTOMATIC. Enter RESPONSE TIMEOUT in milliseconds. Enter the correct speed (in bits per second) to match the speed of the sending unit.

Press XEQ. The STATUS message will display RECEIVING. When the transmission is complete, the STATUS message will read RECEIVED.

50.3.5 Transferring CRT Data

When Software Version 10.02 or above is installed, the COMSTATE II is capable of sending CRT data to or receiving it from an INTERVIEW 30B, 40B, 3600, 4600, COMSTATE I, or COMSTATE II. The COMSTATE II can store approximately 32,000 characters (that is, 1024 lines of 32 characters) as they appear on the screen. For a further description of CRT data, refer to Section 11.

(a) Sending CRT Data. The COMSTATE II can send CRT data directly from its buffer or from tape.

NOTE: Data remains in the buffer only until the RUN key is pressed or the unit is turned off. In Run Mode, buffer contents are erased when CLEAR-CRT is pressed.

To send CRT data to another unit, prepare the Remote Transfer menu of the destination unit to RECEIVE in AUTOMATIC or DUMP mode.

Enter the desired SPEED in bits per second. This should match the transfer speed of the COMSTATE II. When ready, press XEQ.

On the COMSTATE II, select FUNCTION: SEND and TYPE: CRT/DATA.

Specify whether the data is to be sent from TAPE or directly from the BUFFER.

Fill in the number of the first line to be transmitted after START AT LINE. (Entries 1 through 1024 are valid.) Also indicate the NUMBER OF LINES to be transferred. If the number of lines is not specified, only one line will be transferred.

Select MODE: AUTOMATIC or DUMP. Enter the desired SPEED. Enter a name for the data, if you wish. When ready, press XEQ. The word TRANSMITTING should appear in the STATUS area, followed by decrementing hex digits. The display changes to TRANSMITTED, then (NUMBER) BLOCKS TRANSMITTED to indicate that the transfer is complete.

(b) Receiving CRT Data. To receive CRT data, install a formatted PROGRAM/DATA tape in the COMSTATE II. Then select FUNCTION: RECEIVE and TYPE: CRT-DATA on the Parameter 8 menu.

After START AT BLOCK, enter the number of the first block on tape where the data is to be stored. If no START AT BLOCK is given, data is stored beginning at Block 000.

Enter the desired SPEED in bits per second. This should match the speed of the sending unit.

When ready, press XEQ. The message RECEIVING followed by decrementing hexadecimal digits should appear in the STATUS area. This is replaced by RECEIVED, and then (NUMBER) BLOCKS RECEIVED when the transfer is complete.

50.3.6 Aborting an Automatic Transfer

During a transfer, all keys except the PROGRAM key are illegal on both the source and the destination unit. The transfer cannot be restarted until it has been aborted. To abort a transfer of any type from the source COMSTATE II, press the PROGRAM key twice during the transfer. On the source unit, the Program Selection menu will be displayed; on the destination unit, the STATUS message will blink TRANSMISSION ABORTED.

To abort a transfer from the destination unit, press PROGRAM twice during the transfer. On the destination unit, the Program Selection menu will be displayed. On the source unit -- after a brief delay -- the STATUS message NO RECEIVER RESPONSE will blink.

No matter which unit aborts the transfer, the program in the destination unit before the aborted transfer will not be disturbed. However, when a data transfer is aborted, the Data Tape in the destination unit will be overwritten up to the location at which the transfer was aborted.

50.4 REMOTE TRANSFER IN THE DUMP MODE

When DUMP is selected on the Remote Transfer menu, the transfer takes place as soon as the XEQ key is depressed and initial handshaking is performed. The transfer procedes whether or not the COMSTATE II is linked to the recording device. It does not request or wait for acknowledgments.

Data is transmitted in the same format as in automatic mode.

50.4.1 Handshaking in Dump Mode

When transmitting in dump mode, the COMSTATE II conducts no protocol-level (ENQ-ACK) handshaking. However, between message blocks, the COMSTATE II waits 100 milliseconds before driving RTS on, then waits one second for CTS. A message block is sent each time CTS is received.

50.4.2 Cable Configuration

Data, tests or setups may be dumped from the COMSTATE II to other members of the INTERVIEW family (see Table 50-1). To perform a dump to one of these devices, connect the COMSTATE II to the device with an INTERVIEW-to- INTERVIEW cable. If transmitting via modems, use an INTERVIEW-to-Modem cable between each INTERVIEW device and its modem. Connect the cable to the Printer/Remote interface of each device.

50.4.3 Sending a Dump

On the Remote Transfer menu, select FUNCTION: SEND, the TYPE of information to be sent, and MODE: DUMP. If TAPE is selected, specify the location of the first block to be sent. (Block 000 is the default.) Then indicate the number of blocks to follow. If the number of blocks is not given, only one block will be transferred. Enter a SPEED corresponding to that of the recording device.

Set up the recording device to expect asynchronous data with the following characteristics: ASCII, 7 bits, even parity, even LRC, no clock supplied. The speed must agree with that entered on the Remote Transfer menu.

Start the recording device; then press the XEQ key on the COMSTATE II.

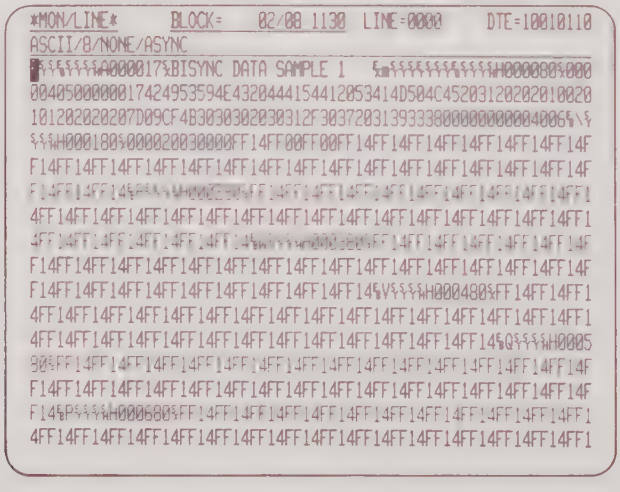

Figure 50-12 Line being monitored during dump.

NOTE: It is important that the first byte dumped be recorded, so that when the recorded program or data is played back, the COMSTATE II can read the record header correctly.

During the transfer, the hexadecimal number of bytes remaining to be transferred will be decrementing at the right of the STATUS field. When the transfer is complete, this number will read 00 00. Then the Status line will display TRANSMITTED to indicate that the transfer has been completed.

If the program or data is viewed on the recording device, it will not be intelligible, because the data stream is in hexadecimal-encoded ASCII. However, the NAME of the program or data will be sent in clear text at the beginning of each dump so each record can be clearly identified. Figure 50-12 shows how the data looks when the line is being monitored.

50.4.4 Receiving a Dump on the COMSTATE II

Set up the recording device to play back data to the COMSTATE II on Pin 2 (TD).

NOTE: When a record is DUMPed back to the COMSTATE II from a recording device, the first byte of the record header must be the first thing received after the synchronization characters; otherwise, the COMSTATE II will be unable to use the record. This should be taken into consideration when the program or data is being recorded.

NOTE: When the COMSTATE II is receiving a dump record there should be no protocol embedded in the record by the communication system.

On the Remote Transfer menu, select FUNCTION: RECEIVE and MODE: DUMP. Specify the TYPE of information to be received. When SETUP or TEST is selected, specify whether the data is to be received directly TO internal MEMORY or TAPE. (When TAPE -- taped line data -- or CRT-DATA is the TYPE selection, the data is always received to tape.) If TAPE or CRT-DATA is selected, indicate the START AT field where the first block of data is to be recorded. If no location is specified, the recording will begin at Block 000. Then fill in the number of blocks to be sent. Only one block will be transferred if no number is given. Be sure the playback speed is the same as the SPEED selected on the Remote Transfer menu.

Press the XEQ key; then start playback from the recording device.

50.4.5 Aborting a Dump

During a dump, all keys except PROGRAM are illegal. The transfer cannot be restarted until it has been aborted.

To abort a transfer of any type from the COMSTATE II, press the PROGRAM key twice during the transfer. This will display the Program Selection menu and stop the transmission.

A dump cannot be aborted by the destination device. If the destination device ceases to receive or record, or if the link between it and the INTERVIEW is broken during the dump, the COMSTATE II will continue to transmit, as indicated by the STATUS message TRANSMITTING and decrementing hexadecimal values on its Remote Transfer menu.

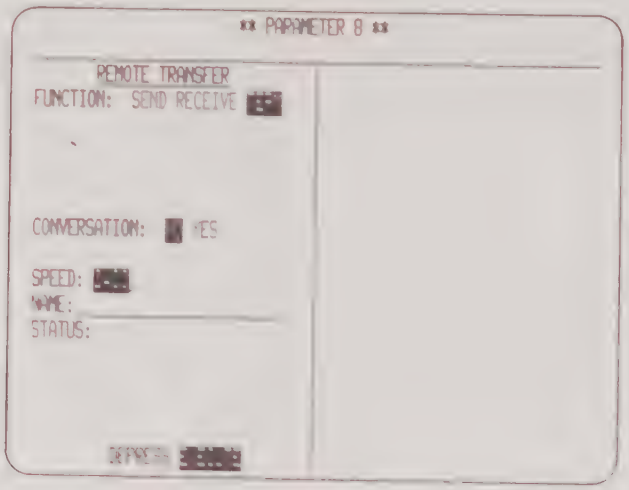
** PARAMETER 8 **
REMOTE TRANSFER
FUNCTION: SEND RECEIVE
CONVERSATION: YES
SPEED:
NAME:
STATUS:

Figure 51-1

51
REMOTE TRANSFER: TERMINAL MODE

The Terminal Mode selection is available on the Parameter 8 menu. (See Figure 51-1.) This selection allows the COMSTATE II to act as a dumb asynchronous terminal. As such, the COMSTATE II can communicate with another point in the network, for informational and diagnostic purposes. In Terminal Mode, the COMSTATE II can also operate an unattended remote INTERVIEW COMSTATE I, 30B, or 40B.

The COMSTATE II can perform a variety of operations on the remotely connected INTERVIEW without the intervention of an operator at the remote end. As long as the remote COMSTATE I, 30B, or 40B contains compatible software and is powered, the COMSTATE II can take control of the device at any time, in order to start or stop test activity in RUN mode, program any menus in PROGRAM mode, or download or upload programs or CRT data via the Remote Transfer screen.

When both terminals are manned, Terminal Mode allows an operator at a COMSTATE II and a remotely connected INTERVIEW terminal (including another COMSTATE II) to exchange messages or instructions on operations being performed.

51.1 HARDWARE CONFIGURATION

In Terminal Mode the COMSTATE II sends and receives data through the Printer/Remote port on the back of the unit.

When the COMSTATE II and another INTERVIEW are connected directly, an INTERVIEW-TO-INTERVIEW cable is used.

Since the Printer/Remote port appears as a DCE, an INTERVIEW-TO-Modem cable may be used to connect directly to the RS-232 connector of a data line. This cable allows the COMSTATE II to appear as a DTE.

When communication is established through a modem, the COMSTATE II is connected to the modem with an INTERVIEW-TO-Modem cable.

NOTE: The INTERVIEW-TO-Modem cable can be connected in only one direction. Be sure to connect the end labeled INTERVIEW to the Printer/Remote connector and the end labeled MODEM to the modem.

Section 50.2.1 provides information on signal transmission through the Printer/Remote connector. Figures 50-3 and 50-4 show pin configurations for the special cables used in remote transfers.

51.2 ACCESSING TERMINAL MODE

To access Terminal Mode on the COMSTATE II, display the Parameter 8 menu. Select FUNCTION: TERM and CONVERSATION: YES or NO. CONVERSATION: YES provides local echo of characters and inserts Line Feeds each time the RETURN key is pressed on this unit or a Carriage Return (CR) is received in the data stream. CONVERSATION: NO provides neither local echo nor line feed insertion.

If the COMSTATE II is connected to a modem, enter a speed to match the speed of the modem.

Press XEQ when you have made your selections. The screen will be cleared, except for the Parameter 8 heading. The COMSTATE II is now in Terminal Mode and can accept valid input.

51.3 KEYBOARD CONTROL AND DISPLAY IN TERMINAL MODE

When operating in Terminal Mode, the COMSTATE II acts as a "normal" dumb, asynchronous terminal. (Figure 51-2.)

The display screen is 64 columns wide. When a line longer than 64 columns is received by the COMSTATE II, the display automatically wraps onto the next line.

All of the light gray alphanumeric keys are valid, as are certain other keys:

- PROGRAM returns the COMSTATE II to Program Mode and the Menu Selections screen.
- ALT returns the COMSTATE II to the Parameter 8 menu (in Program Mode).
- The CTRL key and the ESC key, when pressed simultaneously, produce a BREAK signal. (The COMSTATE II holds a space for 250 milliseconds.) This function is only valid in Terminal Mode.

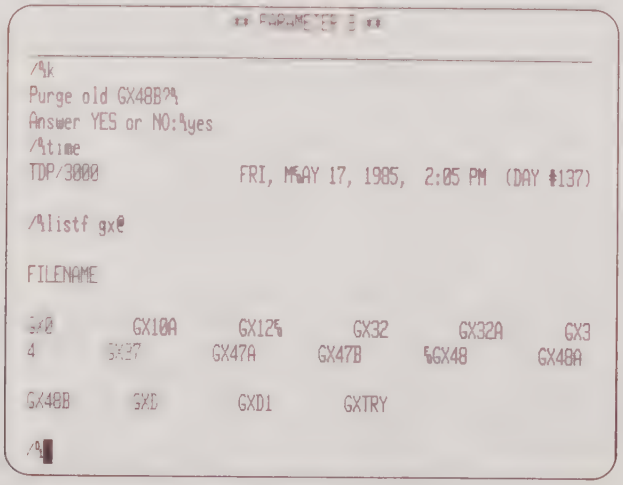

Figure 51-2 The COMSTATE II serves as an asynchronous terminal in Terminal Mode.

- The four arrow keys and the ENTER key function differently when the COMSTATE II is acting as a dumb terminal. In Terminal Mode (as opposed to Program Mode or Run Mode), these keys transmit control characters. LEFT arrow is the equivalent of CTRL-H; RIGHT arrow is the equivalent of CTRL-L; UP arrow is the equivalent of CTRL-K; and DOWN arrow is the equivalent of CTRL-J. The ENTER key acts as a second RETURN key. When the COMSTATE II is controlling a remote INTERVIEW in Program Mode, the arrow keys and the ENTER key can be used to move from selection to selection and from field to field on the remote menu.

- Control characters are also valid. Enter these by simultaneously pressing the CTRL key and another alphanumeric key. The control character which will be sent is indicated on the key. In some cases, you will not see the control characters, only their actions. For example, when you press CTRL-H, the control character does not appear; however, the cursor moves backwards one space. Line Feed and Carriage Return characters are also active but not visible.

NOTE: In combination with the CTRL key, keys 6, 7, 8, 9, 0, and the at sign (@) produce characters which are not displayed on the key. The characters they produce are listed in Table 51-1.

When the remote device is a COMSTATE I, 30B, or 40B which is also in Terminal Mode, the two units are in direct keyboard communication. The entries you make from your keyboard, including control characters, will appear on the other screen. You must select CONVERSATION: YES on the Parameter 8 menu, however, for your half of the conversation to be visible on your screen.

51.4 UNATTENDED REMOTE CONTROL OF A COMSTATE I OR 30B/40B

If the COMSTATE II has been correctly connected to a COMSTATE I, 30B, or 40B (either directly or via modems) and the remote device is turned on, the COMSTATE II can gain control of the device from Terminal Mode. (When controlling an unattended remote device, select CONVERSATION: NO on the Parameter 8 menu.)

Refer to the appropriate technical manual for more information on general operation and unattended remote capabilities: INTERVIEW COMSTATE I Technical Manual, ATLC-107-932-100; or INTERVIEW 30B/40B Technical Manual, ATLC-107-919-102.

TABLE 51-1
CONTROL CHARACTERS NOT INDICATED ON THE KEYBOARD

CONTROL Key In Combination With:	Produces:
6	{
7	}
8	[
9	]
0	|
-	~

51.5 SETTING UP REMOTE TRANSFERS FOR AN UNATTENDED REMOTE DEVICE

The ability of the COMSTATE II to store and forward programs and to collect and reanalyze CRT data samples is complemented by its ability to control transfers of data and programs in Terminal Mode.

For example, the COMSTATE II operator may wish to save an entire test which will be performed repeatedly at the remote site. The test (or only the Setup on Program menu 0, if preferred) may be saved on a Program Only tape in the COMSTATE II for future use. The test may then be reloaded into the same remote device (or a different, compatible remote) whenever the COMSTATE II operator chooses. While the test is running, the operator may interrupt it to retrieve periodic samples of data. All these operations can be performed from the COMSTATE II in Terminal Mode without assistance at the remote site.

Imagine that a COMSTATE II operator wishes to monitor and record statistics on X.25 data received at the unattended remote site. He first sends the remote INTERVIEW a test called X.25 Stat Check from the Program Only tape installed in the COMSTATE II. The test is stored on the tape at Block 16 and is a COMSTATE I test, as indicated on the Program Tape Directory. The COMSTATE II operator proceeds as follows:

(1) He selects Terminal Mode and Conversation: No on the COMSTATE II and presses XEQ. He then attaches to the remote INTERVIEW by pressing CTRL-ESC repeatedly until the READY message appears on his screen.

(2) Next, he calls up the Remote Transfer menu for the other INTERVIEW. Using the cursor arrows and ENTER key, he scrolls through the menu and makes the proper selections. He then scans the remote menu to check his selections and sees a display similar to Figure 51-3. In this case, the remote RECEIVES in AUTOMATIC MODE at the correct speed for the modem or INTERVIEW connected to the remote.

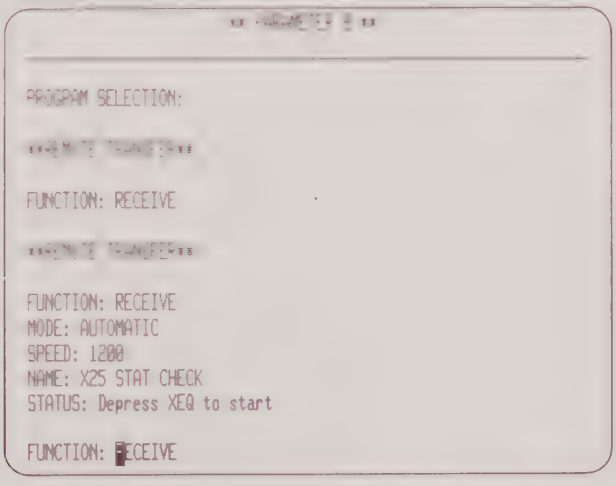

Figure 51-3 Once he has programmed it, the operator displays the Remote Transfer menu of the other INTERVIEW.

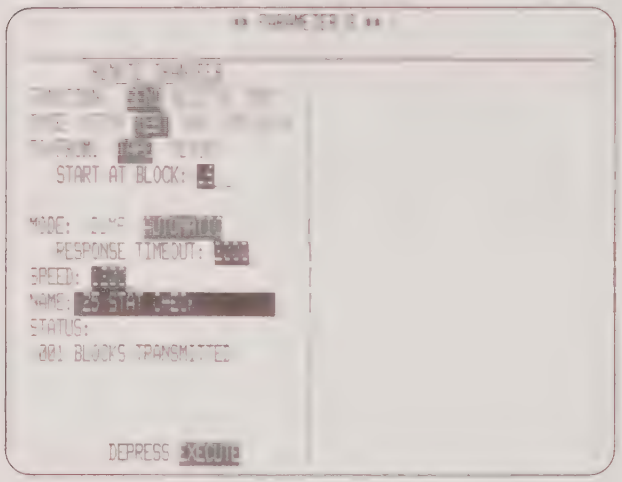

Figure 51-4 He then prepares the COMSTATE II to send a program.

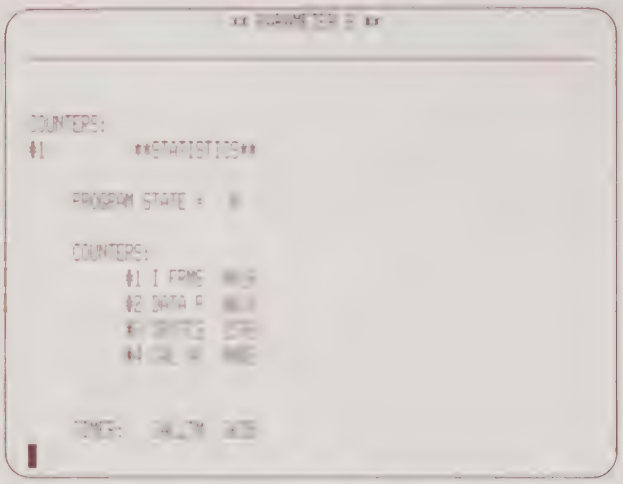

Figure 51-5 The operator checks the remote's statistics menu.

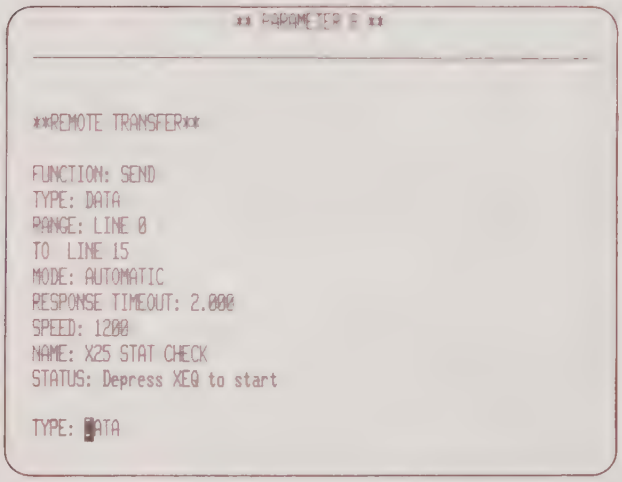

Figure 51-6 After running the test, the operator reconfigures the Remote Transfer menu of the other INTERVIEW to send data.

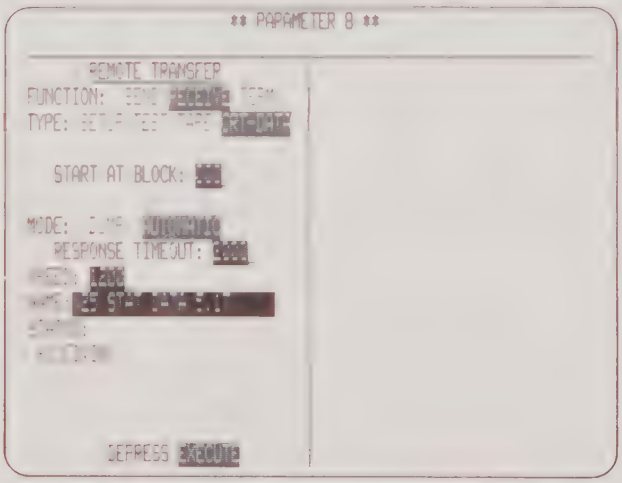

Figure 51-7 Finally, he sets his own Remote Transfer menu to receive CRT data for later analysis.

(3) The operator "executes" the remote half of the transfer using the prescribed command.

(4) To configure the COMSTATE II, the operator presses the ALT key to leave Terminal Mode and return to the Parameter 8 menu. He sets the COMSTATE II to SEND the appropriate TEST from TAPE, STARTing AT BLOCK 16. He also enters the correct speed of the communication line. (See the completed menu in Figure 51-4.) The actual transfer begins once he presses XEQ. Decrementing hex values appear on the screen, and a message indicates when the transfer is complete.

NOTE: If you must abort a transfer, be sure to abort both sides of the transfer. Send a BREAK (CTRL-ESC) to cause the unattended remote to abort. This returns the remote INTERVIEW to Program Mode. To abort the transfer from the COMSTATE II, press PROGRAM.

As soon as the test has been transferred, the COMSTATE II operator runs the test on the remote INTERVIEW as follows:

(1) He again selects Terminal Mode and Conversation: NO and then presses XEQ.

(2) The operator presses the appropriate command to run the test on the COMSTATE I.

(3) Using another command, he checks the statistics menu in the remote device (See Figure 51-5.)

(4) After a time, he ends the test by returning the remote device to PROGRAM mode.

As a final step, the COMSTATE II operator retrieves the CRT data and stores it for later analysis. He does so as follows:

(1) The operator calls the Remote Transfer menu of the other INTERVIEW. He selects FUNCTION: SEND AND TYPE: DATA on the remote menu. (See Figure 51-6.) When selections are made, he "executes" this half of the transfer.

(2) He displays the COMSTATE II's Parameter 8 screen and prepares to RECEIVE CRT-DATA. (See Figure 51-7.) The data is received to tape (in this case, starting at BLOCK 000). The final transfer takes place when he presses the XEQ key on the COMSTATE II. A message indicates the completion of the transfer.

For further information on Remote Transfer Procedures, refer to Section 50. Analysis of CRT data is explained in Section 11.

APPENDIX A
KEYBOARD TRANSLATION TABLES

EBCDIC

KEY	UNSHIFTED		SHIFTED		CONTROL	
A	a	81	A	C1	SOH	01
B	b	82	B	C2	STX	02
C	c	83	C	C3	ETX	03
D	d	84	D	C4	EOT	37
E	e	85	E	C5	ENQ	2D
F	f	86	F	C6	ACK	2E
G	g	87	G	C7	BELL	2F
H	h	88	H	C8	BS	16
I	i	89	I	C9	HT	05
J	j	91	J	D1	LF	25
K	k	92	K	D2	VT	0B
L	l	93	L	D3	FF	0C
M	m	94	M	D4	GS	1D
N	n	95	N	D5	SO	0E
O	o	96	O	D6	SI	0F
P	p	97	P	D7	DLE	10
Q	q	98	Q	D8	DC1	11
R	r	99	R	D9	DC2	12
S	s	A2	S	E2	DC3	13
T	t	A3	T	E3	DC4	3C
U	u	A4	U	E4	NAK	3D
V	v	A5	V	E5	SYN	32
W	w	A6	W	E6	ETB	26
X	x	A7	X	E7	CAN	18
Y	y	A8	Y	E8	EM	19
Z	z	A9	Z	E9	SUB	3F
0	0	F0	NU	00	¦	6A
1	1	F1	!	5A	—	—
2	2	F2	"	7F	—	—
3	3	F3	#	7B	—	—
4	4	F4	$	5B	—	—
5	5	F5	%	6C	—	—
6	6	F6	&	50	{	C0
7	7	F7	'	7D	}	D0
8	8	F8	(	4D	—	—
9	9	F9	)	5D	—	—
SPACE	SPACE	40	SPACE	40	SPACE	40
;	;	5E	:	7A	NULL	00
.	.	6B	<	4C	RS	35
DASH	DASH	60	=	7E	DASH	60
.	.	4B	>	6E	VS	1F
/	/	61	?	6F	FS	22
\	\	E0	@	7C	~	A1
UNDERLINE	—	6D	`	79	DEL	FF
CR	CR	0D	CR	0D	CR	0D
+	+	4E	*	5C	+	4E
ESC	EC	27	EC	27	—	—

ASCII (Space Parity shown)

KEY	UNSHIFTED		SHIFTED		CONTROL	
A	a	61	A	41	SOH	01
B	b	62	B	42	STX	02
C	c	63	C	43	ETX	03
D	d	64	D	44	EOT	04
E	e	65	E	45	ENQ	05
F	f	66	F	46	ACK	06
G	g	67	G	47	BELL	07
H	h	68	H	48	BS	08
I	i	69	I	49	HT	09
J	j	6A	J	4A	LF	0A
K	k	6B	K	4B	VT	0B
L	l	6C	L	4C	FF	0C
M	m	6D	M	4D	GS	1D
N	n	6E	N	4E	SO	0E
O	o	6F	O	4F	SI	0F
P	p	70	P	50	DLE	10
Q	q	71	Q	51	DC1	11
R	r	72	R	52	DC2	12
S	s	73	S	53	DC3	13
T	t	74	T	54	DC4	14
U	u	75	U	55	NAK	15
V	v	76	V	56	SYN	16
W	w	77	W	57	ETB	17
X	x	78	X	58	CAN	18
Y	y	79	Y	59	EM	19
Z	z	7A	Z	5A	SUB	1A
0	0	30	^	5E	¦	7C
1	1	31	!	21	—	—
2	2	32	"	22	—	—
3	3	33	#	23	—	—
4	4	34	$	24	—	—
5	5	35	%	25	—	—
6	6	36	&	26	{	7B
7	7	37	'	27	}	7D
8	8	38	(	28	[	5B
9	9	39	)	29	]	5D
SPACE	SPACE	20	SPACE	20	SPACE	20
;	;	3B	:	3A	NULL	00
.	.	2C	<	3C	RS	1E
DASH	DASH	2D	=	3D	DASH	20
.	.	2E	>	3E	VS	1F
/	/	2F	?	3F	FS	JC
\	\	5C	@	40	—	—
UNDERLINE	—	5F	\	60	DEL	7F
CR	CR	0D	CR	0D	CR	0D
+	+	2B	*	2A	+	2B
ESC	EC	1B	EC	1B	—	—

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*Characters shown beside each key are the characters actually transmitted.

EBCD (Odd Parity shown)

KEY	DOWNSHIFT (-)		UPSHIFT (+)		CONTROL	
A	a	23	A	23	SOH	3E
B	b	13	B	13	STX	—
C	c	73	C	73	ETX	—
D	d	0B	D	0B	EOT	7C
E	e	6B	E	6B	ENQ	—
F	f	5B	F	5B	ACK	—
G	g	3B	G	3B	BELL	—
H	h	07	H	07	BS	5D
I	i	67	I	67	HT	2F
J	j	61	J	61	LF	6E
K	k	51	K	51	VT	—
L	l	31	L	31	FF	—
M	m	49	M	49	GS	—
N	n	29	N	29	SO	—
O	o	19	O	19	SI	—
P	p	79	P	79	DLE	—
Q	q	45	Q	45	DC1	—
R	r	25	R	25	DC2	4C
S	s	52	S	52	DC3	—
T	t	32	T	32	DC4	4F
U	u	4A	U	4A	NAK	—
V	v	2A	V	2A	SYN	3D
W	w	1A	W	1A	ETB	5E
X	x	7A	X	7A	CAN	—
Y	y	46	Y	46	EM	—
Z	z	26	Z	26	SUB	—
0	0	54 (LC)	)	54 (LC)	—	—
	Λ	1C (UC)	Λ	1C (UC)	—	—
1	1	20 (LC)	=	20 (LC)	—	—
	$	75 (UC)	!	75 (UC)	—	—
2	2	10 (LC)	<	10 (LC)	—	—
	#	34 (UC)	"	34 (UC)	—	—
3	3	70 (LC)	;	70 (LC)	—	—
	#	34 (UC)	"	34 (UC)	—	—
4	4	08 (LC)	:	08 (LC)	—	—
	$	75 (UC)	!	75 (UC)	—	—
5	5	68	%	68	—	—
6	6	58 (LC)	APOSTROPHE	58 (LC)	—	—
	&	43 (UC)	+	43 (UC)	—	—
7	7	38 (LC)	>	38 (LC)	—	—
	6	58 (UC)	APOSTROPHE	58 (UC)	—	—
8	8	04 (LC)	*	04 (LC)	—	—
	9	64 (UC)	(	64 (UC)	—	—
9	9	64 (LC)	(	64 (LC)	—	—
	0	54 (UC)	)	54 (UC)	—	—
SPACE	SPACE	00	SPACE	00	—	—
	; 3	70 (LC)	;	70 (LC)	—	—
	4	08 (UC)	:	08 (UC)	—	—
,	,	76 (LC)	—	76 (LC)	—	—
	2	10 (UC)	<	10 (UC)	—	—
DASH	—	01 (LC)	—	01 (LC)	—	—
	1	20 (UC)	=	20 (UC)	—	—
PERIOD	.	37 (LC)	—	37 (LC)	—	—
	7	38 (UC)	>	38 (UC)	—	—
/	/	62	?	62	—	—
\	\	1F (LC)	\	1F (LC)	—	—
	@	02 (UC)	—	02 (UC)	—	—
UNDERLINE	—	—	—	—	—	—
CR	CR	6D	CR	6D	—	—
+	—	—	—	—	—	—
ESC	—	—	—	—	—	—

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XS-3 (SY = 35; EOM = 55)

KEY	UNSHIFTED		SHIFTED		CONTROL	
A	a	14	a	14	SOH	—
B	b	15	b	15	STX	—
C	c	16	c	16	ETX	—
D	d	17	d	17	EOT	—
E	e	18	e	18	ENQ	—
F	f	19	f	19	ACK	—
G	g	1A	g	1A	BELL	—
H	h	1B	h	1B	BS	—
I	i	1C	i	1C	HT	—
J	j	24	j	24	LF	—
K	k	25	k	25	VT	—
L	l	26	l	26	FF	—
M	m	27	m	27	GS	—
N	n	28	n	28	SO	—
O	o	29	o	29	SI	—
P	p	2A	p	2A	DLE	—
Q	q	2B	q	2B	DC1	—
R	r	2C	r	2C	DC2	—
S	s	35	s	35	DC3	—
T	t	36	t	36	DC4	—
U	u	37	u	37	NAK	—
V	v	38	v	38	SYN	—
W	w	39	w	39	ETB	—
X	x	3A	x	3A	CAN	—
Y	y	3B	y	3B	EM	—
Z	z	3C	z	3C	SUB	—
0	0	03	Λ	2F	—	—
1	1	04	!	23	—	—
2	2	05	"	—	—	—
3	3	06	#	1F	—	—
4	4	07	$	22	—	—
5	5	08	%	2D	—	—
6	6	09	&	33	—	—
7	7	0A	'	2E	—	—
8	8	0B	(	31	—	—
9	9	0C	)	3D	—	—
SPACE	SPACE	00	SPACE	00	—	—
;	;	0E	:	11	NULL	—
.	.	32	<	1E	RS	—
DASH	-	02	=	1D	—	—
.	.	12	>	3E	US	—
/	/	34	?	13	FS	—
\	\	0D	@	20	—	—
UNDERLINE	UNDERLINE	30		—	DEL	—
CR	CR	—	CR	—	CR	—
+	—	—	—	—	—	
ESC	—	—	—	—	—	—

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*Characters shown beside each key are the characters actually transmitted.

IPARS

KEY	UNSHIFTED		SHIFTED		CONTROL	
A	A	31	A	31	SOH	—
B	B	32	B	32	STX	—
C	C	33	C	33	ETX	—
D	D	34	D	34	EOT	—
E	E	35	E	35	ENQ	—
F	F	36	F	36	ACK	—
G	G	37	G	37	BELL	—
H	H	38	H	38	BS	—
I	I	39	I	39	HT	—
J	J	21	J	21	LF	—
K	K	22	K	22	VT	—
L	L	23	L	23	FF	—
M	M	24	M	24	GS	—
N	N	25	N	25	SO	—
O	O	26	O	26	SI	—
P	P	27	P	27	DLE	—
Q	Q	28	Q	28	DC1	—
R	R	29	R	29	DC2	—
S	S	12	S	12	DC3	—
T	T	13	T	13	DC4	—
U	U	14	U	14	NAK	—
V	V	15	V	15	SYN	—
W	W	16	W	16	ETB	—
X	X	17	X	17	CAN	—
Y	Y	18	Y	18	EM	—
Z	Z	19	Z	19	SUB	—
0	0	0A			—	—
1	1	01	!		—	—
2	2	02			—	—
3	3	03	#	1B	—	—
4	4	04	$	30	—	—
5	5	05	%	3C	—	—
6	6	06	&		—	—
7	7	07	'		—	—
8	8	08	(	2F	—	—
9	9	09	)	2F	—	—
SPACE	SPACE	1C	SPACE	1C	—	—
:		00	:	2A	NULL	00
,	,	1F	<		RS	—
DASH	DASH	1A	-	0E	—	—
.	.	3B	.	3B	US	—
/	—	—	?	3A	FS	—
\	—	—		—	—	—
UNDERLINE	UNDERLINE	—			DEL	—
CR	CR	0C	CR	0C	CR	0C
+	—	—	—	—	—	—
ESC	—	—	—	—	—	—

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REVERSE EBCD (Odd Parity shown)

KEY	DOWNSHIFT (\)		UPSHIFT (^)		CONTROL	
A	a	31	A	31	SOH	—
B	b	32	B	32	STX	—
C	c	73	C	73	ETX	—
D	d	34	D	34	EOT	4F
E	e	75	E	75	ENQ	—
F	f	76	F	76	ACK	—
G	g	37	G	37	BELL	—
H	h	38	H	38	BS	6E
I	i	79	I	79	HT	3D
J	j	61	J	61	LF	5D
K	k	62	K	62	VT	—
L	l	23	L	23	FF	0D
M	m	64	M	64	GS	—
N	n	25	N	25	SO	—
O	o	26	O	26	SI	—
P	p	67	P	67	DLE	—
Q	q	68	Q	68	DC1	—
R	r	29	R	29	DC2	—
S	s	52	S	52	DC3	—
T	t	13	T	13	DC4	—
U	u	54	U	54	NAK	—
V	v	15	V	15	SYN	—
W	w	16	W	16	ETB	5E
X	x	57	X	57	CAN	—
Y	y	58	Y	58	EM	—
Z	z	19	Z	19	SUB	—
0	0	4A (LC)	)	4A (LC)	—	—
	^	0E (UC)	^	0E (UC)	—	—
1	1	01 (LC)	=	01 (LC)	—	—
	$	6B (UC)	!	6B (UC)	—	—
2	2	02 (LC)	<	02 (LC)	—	—
	#	0B (UC)	"	0B (UC)	—	—
3	3	43 (LC)	,	43 (LC)	—	—
	#	0B (UC)	"	0B (UC)	—	—
4	4	04 (LC)		04 (LC)	—	—
	$	68 (UC)	!	6B (UC)	—	—
5	5	45	%	45	—	—
6	6	46 (LC)	`	46 (LC)	}	1C (DS)
	&	70 (UC)	+	70 (UC)	}	1C (US)
7	7	07 (LC)	>	07 (LC)	}	1C (DS)
	6	46 (UC)	`	46 (UC)	{	1C (US)
8	8	08 (LC)	*	08 (LC)	{	4C (DS)
	9	49 (UC)	(	49 (UC)	|	4C (US)
9	9	49 (LC)	(	49 (UC)	|	4C (DS)
	0	4A (UC)	)	4A (UC)	|	4C (US)
SPACE	SPACE	40	SPACE	40	—	—
;	3	43 (LC)	;	43 (LC)	—	—
	4	04 (UC)	:	04 (UC)	—	—
,	,	5B (LC)	—	5B (LC)	—	—
	2	02 (UC)	<	02 (UC)	—	—
DASH	DASH	20 (LC)	—	20 (LC)	—	—
	1	01 (UC)	=	01 (UC)	—	—
PERIOD	.	3B (LC)	—	3B (LC)	—	—
	7	07 (UC)	>	07 (UC)	—	—
/	/	51	?	51	~	7C (DS)
\	\	3E (LC)	\	3E (LC)	'	7C (US)
	@	10 (UC)	—	10 (UC)	—	—
UNDERLINE	—	— (LC)	—	— (LC)	NULL	7F (DS)
	~	7C (UC)	'	7C (UC)	NULL	7F (US)
CR	CR	60	CR	60	—	—
+	—	—	—	—	—	—
ESC	—	—	—	—	—	—

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*Characters shown beside each key are the characters actually transmitted.

SELECTRIC

KEY	DOWNSHIFT (↘)		UPSHIFT (↗)		CONTROL	
A	a	39	A	39	SOH	—
B	b	36	B	36	STX	—
C	c	3A	C	3A	ETX	—
D	d	2A	D	2A	EOT	3C
E	e	0A	E	0A	ENQ	—
F	f	33	F	33	ACK	—
G	g	23	G	23	BELL	—
H	h	26	H	26	BS	1D
I	i	19	I	19	HT	2F
J	j	03	J	03	LF	2F
K	k	1A	K	1A	VT	—
L	l	06	L	06	FF	—
M	m	21	M	21	GS	—
N	n	12	N	12	SO	—
O	o	05	O	05	SI	—
P	p	0B	P	0B	DLE	—
Q	q	1B	Q	1B	DC1	—
R	r	29	R	29	DC2	—
S	s	25	S	25	DC3	—
T	t	02	T	02	DC4	—
U	u	32	U	32	NAK	—
V	v	31	V	31	SYN	—
W	w	35	W	35	ETB	1E
X	x	22	X	22	CAN	—
Y	y	27	Y	27	EM	—
Z	z	14	Z	14	SUB	—
0	0	64 (LC)	^	6A (LC)	—	—
		1C (UC)	)	1C (UC)	—	—
1	1	20 (LC)	|	20 (LC)	—	—
	!	01 (UC)	—	01 (UC)	—	—
2	2	10 (LC)	@	10 (LC)	—	—
	"	49 (UC)	"	49 (UC)	—	—
3	3	70	#	70	—	—
4	4	04	$	04	—	—
5	5	08	%	08	—	—
6	6	58 (LC)	—	58 (LC)	—	—
	7	68 (UC)	&	68 (UC)	—	—
7	7	68 (LC)	&	68 (LC)	—	—
	'	49 (UC)	"	49 (UC)	—	—
8	8	38 (LC)	*	38 (LC)	—	—
	9	34 (UC)	(	34 (UC)	—	—
9	9	34 (LC)	(	34 (LC)	—	—
	0	64 (UC)	)	64 (UC)	—	—
SPACE	SPACE	40	SPACE	40	—	—
;	;	6B	:	6B	—	—
.	,	3B (LC)	,	3B (LC)	RS	2C (DS)
	—	— (UC)	—	— (UC)	RS	2C (US)
DASH	DASH	37 (LC)	UNDERLINE	37 (LC)	—	—
	=	13 (UC)	+	13 (UC)	—	—
PERIOD	.	51 (LC)	.	51 (LC)	—	—
	—	— (UC)	—	— (UC)	—	—
/	/	07	?	07	—	—
\	\	1F (LC)	\	1F (LC)	—	—
	2	10 (UC)	@	10 (UC)	—	—
UNDERLINE	DASH	37 (LC)	UNDERLINE	37 (LC)	DEL	7F (DS)
	—	— (UC)	—	— (UC)	DEL	7F (US)
CR	CR	60	CR	60	—	—
+	—	—	—	—	—	—
ESC	—	—	—	—	—	—

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*Characters shown beside each key are the characters actually transmitted.

APPENDIX B
INPUT-TO-DISPLAY TABLES

INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT REVERSE	REV EBCD CBA8421		BAUDOT		SELECTRIC	
			DS	US		HEX	DS	US	LETTERS	FIGURES	DS	US
00	NU	NU	(SPACE)	(SPACE)	(SPACE)	(HEX)	(SPACE)	(SPACE)	(HEX)	(HEX)	SP	SP
01	SH	SH	[illegible]	[illegible]	!	1	1	=	E	3	!	(HEX)
02	SX	SX	@	(HEX)	[illegible]	2	2	<	LF	LF	t	T
03	EX	EX	&	+	0	3	3	;	A	—	j	J
04	ET	(HEX)	8	*	1	4	4	:	(SPACE)	(HEX)	4	$
05	EQ	HT	q	Q	2	5	5	%	S	(HEX)	o	O
06	AK	(HEX)	y	Y	3	6	6	'	I	8	l	L
07	BL	(HEX)	h	H	4	7	7	>	U	7	/	?
08	BS	(HEX)	4	:	5	8	8	*	CR	CR	5	%
09	HT	(HEX)	m	M	6	9	9	(	D	$	'	"
0A	LF	(HEX)	u	U	7	0	0	)	R	4	e	E
0B	VT	VT	d	D	8	*	#	"	J	'	p	P
0C	FF	FF	D2	D2	9	CR	[	]	N	,	(HEX)	(HEX)
0D	CR	CR	(HEX)	(HEX)		(HEX)	FF	FF	F	!	(HEX)	(HEX)
0E	SO	SO	(HEX)	(HEX)	.	—	Λ	Λ	C	:	(HEX)	(HEX)
0F	SI	SI	D4	D4	[	(HEX)	ET	ET	K	(	(HEX)	(HEX)
10	DL	DL	2	<	·	(HEX)	@	(HEX)	T	5	2	@
11	D1	D1	k	K		(HEX)	/	?	Z	(HEX)	.	.
12	D2	D2	s	S	.	S	s	S	L	)	n	N
13	D3	D3	b	B	?	T	t	T	W	2	=	+
14	D4	(HEX)	0	)	A	U	u	U	H	#	z	Z
15	NK	(HEX)	(HEX)	(HEX)	B	V	v	V	Y	6	(HEX)	(HEX)
16	SY	BS	.	(HEX)	C	W	w	W	P	0	(HEX)	(HEX)
17	EB	(HEX)	(HEX)	(HEX)	D	X	x	X	Q	1	(HEX)	(HEX)
18	CN	CN	6	'	E	Y	y	Y	O	9	6	(HEX)
19	EM	EM	o	O	F	Z	z	Z	B	?	i	I
1A	SB	(HEX)	w	W	G	[illegible]	(HEX)	(HEX)	G	&	k	K
1B	EC	(HEX)	f	F	H	#	.	(HEX)	Λ	Λ	q	Q
1C	FS	(HEX)	Λ	Λ	I	(SPACE)	}	{	M	.	Λ	Λ
1D	GS	GS	BS	BS	=	(HEX)	LF	LF	X	/	BS	BS
1E	RS	RS	EB	EB	<	|	EB	EB	V	;	EB	EB
1F	US	US	\	\	#	.	(HEX)	(HEX)	\	\	\	\

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INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE HEX	REV EBCD CBA8421		BAUDOT		SELECTRIC	
			DS	US			DS	US	LETTERS	FIGURES	DS	US
20	(SPACE)	(HEX)	1	=	@	@	UNDER-SCORE	DASH	(HEX)	(HEX)	1	[
21	!	(HEX)	j	J	*	J	j	J	(HEX)	(HEX)	m	M
22	"	FS	/	?	$	K	k	K	(HEX)	(HEX)	x	X
23	#	(HEX)	a	A	!	L	l	L	(HEX)	(HEX)	g	G
24	$	(HEX)	9	(	J	M	m	M	(HEX)	(HEX)	0	)
25	%	LF	r	R	K	N	n	N	(HEX)	(HEX)	s	S
26	&	EB	z	Z	L	O	o	O	(HEX)	(HEX)	h	H
27	'	EC	i	I	M	P	p	P	(HEX)	(HEX)	y	Y
28	(	(HEX)	S	%	N	Q	q	Q	(HEX)	(HEX)	7	&
29	)	(HEX)	n	N	O	R	r	R	(HEX)	(HEX)	r	R
2A	*	(HEX)	v	V	P	:	(HEX)	(HEX)	(HEX)	(HEX)	d	D
2B	+	(HEX)	e	E	Q	<	$	!	(HEX)	(HEX)	;	:
2C	,	(HEX)	RS	RS	R	+	(HEX)	(HEX)	(HEX)	(HEX)	RS	RS
2D	–	EQ	CR	CR	%	(HEX)	CR	CR	(HEX)	(HEX)	CR	CR
2E	.	AK	LF	LF	'	)	BS	BS	(HEX)	(HEX)	LF	LF
2F	/	BL	HT	HT	A	(	(HEX)	(HEX)	(HEX)	(HEX)	HT	HT
30	0	(HEX)	3	;	UNDER-SCORE	$	&	+	(HEX)	(HEX)	3	#
31	1	(HEX)	l	L	(	A	a	A	(HEX)	(HEX)	v	V
32	2	SY	t	T	.	B	b	B	(HEX)	(HEX)	u	U
33	3	(HEX)	c	C	&	C	c	C	(HEX)	(HEX)	f	F
34	4	(HEX)	#	"	/	D	d	D	(HEX)	(HEX)	q	(
35	5	RS	$	!	S*	E	e	E	(HEX)	(HEX)	w	W
36	6	(HEX)	.	(HEX)	T	F	f	F	(HEX)	(HEX)	b	B
37	7	ET	.	(HEX)	U	G	g	G	(HEX)	(HEX)	DASH	UNDER-SCORE
38	8	(HEX)	7	>	V	H	h	H	(HEX)	(HEX)	8	*
39	9	(HEX)	p	P	W	I	i	I	(HEX)	(HEX)	a	A
3A	:	(HEX)	x	X	X	?	(HEX)	(HEX)	(HEX)	(HEX)	c	C
3B	;	(HEX)	g	G	Y	.	.	(HEX)	(HEX)	(HEX)	.	,
3C	<	D4	ET	ET	Z	%	~	'	(HEX)	(HEX)	ET	ET
3D	=	NK	SY	SY	)	(HEX)	HT	HT	(HEX)	(HEX)	(HEX)	(HEX)
3E	>	(HEX)	SH	SH	>	"	\	\	(HEX)	(HEX)	(HEX)	(HEX)
3F	?	SB	(PAD)	(PAD)	"	(HEX)	PAD	PAD	(HEX)	(HEX)	PAD (DEL)	PAD (DEL)

* SYNC = even parity S (35_{16}).

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INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT REVERSE HEX	REV EBCD CBA8421		BAUDOT		SELECTRIC	
			DS	US			DS	US	LETTERS	FIGURES	DS	US
40	@	(SPACE)	(SPACE)	(SPACE)	(SPACE)	(HEX)	(SPACE)	(SPACE)	(HEX)	(HEX)	SP	SP
41	A	(HEX)	—	—		(HEX)	1	=	(HEX)	(HEX)	!	(HEX)
42	B	(HEX)	@	(HEX)		(HEX)	2	<	(HEX)	(HEX)	t	T
43	C	(HEX)	&	+	0	(HEX)	3	;	(HEX)	(HEX)	j	J
44	D	(HEX)	8	*	1	(HEX)	4	:	(HEX)	(HEX)	4	$
45	E	(HEX)	q	Q	2	(HEX)	5	%	(HEX)	(HEX)	o	O
46	F	(HEX)	y	Y	3	(HEX)	6	'	(HEX)	(HEX)	l	L
47	G	(HEX)	h	H	4	(HEX)	7	>	(HEX)	(HEX)	/	?
48	H	(HEX)	4	:	5	(HEX)	8	*	(HEX)	(HEX)	5	%
49	I	(HEX)	m	M	6	(HEX)	9	(	(HEX)	(HEX)	'	"
4A	J	(HEX)	u	U	7	(HEX)	0	)	(HEX)	(HEX)	e	E
4B	K	.	d	D	8	(HEX)	#	"	(HEX)	(HEX)	p	P
4C	L	<	D2	D2	9	(HEX)	|	|	(HEX)	(HEX)	(HEX)	(HEX)
4D	M	(	(HEX)	(HEX)		(HEX)	FF	FF	(HEX)	(HEX)	(HEX)	(HEX)
4E	N	+	(HEX)	(HEX)		(HEX)	Λ	Λ	(HEX)	(HEX)	(HEX)	(HEX)
4F	O	(HEX)	D4	D4		(HEX)	ET	ET	(HEX)	(HEX)	(HEX)	(HEX)
50	P	&	2	<		(HEX)	@	(HEX)	(HEX)	(HEX)	2	@
51	Q	(HEX)	k	K		(HEX)	'	?	(HEX)	(HEX)	.	.
52	R	(HEX)	s	S	.	(HEX)	s	S	(HEX)	(HEX)	n	N
53	S	(HEX)	b	B	?	(HEX)	t	T	(HEX)	(HEX)	=	+
54	T	(HEX)	0	)	A	(HEX)	u	U	(HEX)	(HEX)	z	Z
55	U	(HEX)	(HEX)	(HEX)	B*	(HEX)	v	V	(HEX)	(HEX)	(HEX)	(HEX)
56	V	(HEX)	(HEX)	(HEX)	C	(HEX)	w	W	(HEX)	(HEX)	(HEX)	(HEX)
57	W	(HEX)	(HEX)	(HEX)	D	(HEX)	x	X	(HEX)	(HEX)	(HEX)	(HEX)
58	X	(HEX)	6	'	E	(HEX)	y	Y	(HEX)	(HEX)	6	(HEX)
59	Y	(HEX)	o	O	F	(HEX)	z	Z	(HEX)	(HEX)	i	I
5A	Z	!	w	W	G	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)	k	K
5B	[	$	f	F	H	(HEX)	.	(HEX)	(HEX)	(HEX)	q	Q
5C	\	*	Λ	Λ	I	(HEX)	}	{	(HEX)	(HEX)	Λ	Λ
5D	]	)	BS	BS	=	(HEX)	LF	LF	(HEX)	(HEX)	BS	BS
5E	Λ	;	EB	EB	<	(HEX)	EB	EB	(HEX)	(HEX)	EB	EB
5F	—	(HEX)	\	\	#	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)	\	\

* EOM = even parity B (55_{16}).

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INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE HEX	REV EBCD CBA8421		BAUDOT		SELECTRIC	
			DS	US			DS	US	LETTERS	FIGURES	DS	US
60	`	DASH	1	=	@	(HEX)	DASH	DASH	(HEX)	(HEX)	1	[
61	a	/	j	J	*	(HEX)	j	J	(HEX)	(HEX)	m	M
62	b	(HEX)	/	?	$	(HEX)	k	K	(HEX)	(HEX)	x	X
63	c	(HEX)	a	A	!	(HEX)	l	L	(HEX)	(HEX)	g	G
64	d	(HEX)	9	(	J	(HEX)	m	M	(HEX)	(HEX)	0	)
65	e	(HEX)	r	R	K	(HEX)	n	N	(HEX)	(HEX)	s	S
66	f	(HEX)	z	Z	L	(HEX)	o	O	(HEX)	(HEX)	h	H
67	g	(HEX)	i	I	M	(HEX)	p	P	(HEX)	(HEX)	y	Y
68	h	(HEX)	5	%	N	(HEX)	q	Q	(HEX)	(HEX)	7	&
69	i	(HEX)	n	N	O	(HEX)	r	R	(HEX)	(HEX)	r	R
6A	j	:	v	V	P	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)	d	D
6B	k	.	e	E	Q	(HEX)	$	!	(HEX)	(HEX)	;	:
6C	l	%	RS	RS	R	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)	RS	RS
6D	m	UNDERLINE	CR	CR	%	(HEX)	CR	CR	(HEX)	(HEX)	CR	CR
6E	n	>	LF	LF	'	(HEX)	BS	BS	(HEX)	(HEX)	LF	LF
6F	o	?	HT	HT	^	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)	HT	HT
70	p	(HEX)	3	;	UNDERLINE	(HEX)	&	+	(HEX)	(HEX)	3	#
71	q	(HEX)	l	L	(	(HEX)	a	A	(HEX)	(HEX)	v	V
72	r	(HEX)	t	T	,	(HEX)	b	B	(HEX)	(HEX)	u	U
73	s	(HEX)	c	C	&	(HEX)	c	C	(HEX)	(HEX)	f	F
74	t	(HEX)	#	"	/	(HEX)	d	D	(HEX)	(HEX)	q	(
75	u	(HEX)	$	!	S	(HEX)	e	E	(HEX)	(HEX)	w	W
76	v	(HEX)	.	(HEX)	T	(HEX)	f	F	(HEX)	(HEX)	b	B
77	w	(HEX)	.	(HEX)	U	(HEX)	g	G	(HEX)	(HEX)	DASH	UNDERLINE
78	x	(HEX)	7	>	V	(HEX)	h	H	(HEX)	(HEX)	8	*
79	y	`	p	P	W	(HEX)	i	I	(HEX)	(HEX)	a	A
7A	z	:	x	X	X	(HEX)	(HEX)	(HEX)	(HEX)	(HEX)	c	C
7B	{	#	g	G	Y	(HEX)	.	(HEX)	(HEX)	(HEX)	,	,
7C	:	@	ET	ET	Z	(HEX)	~	`	(HEX)	(HEX)	ET	ET
7D	}	'	SY	SY	)	(HEX)	HT	HT	(HEX)	(HEX)	(HEX)	(HEX)
7E	~	=	SH	SH	>	(HEX)	\	\	(HEX)	(HEX)	(HEX)	(HEX)
7F	(PAD) DEL	"	(PAD) DEL	(PAD) DEL	"	(HEX)	(PAD)	(PAD)	(HEX)	(HEX)	PAD(DEL)	PAD(DEL)

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INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE	REV EBCD CBA8421		BAUDOT		SELECTRIC	
			DS	US		HEX	DS	US	LETTERS	FIGURES	DS	US
80	NU	(HEX)			(HEX)	(HEX)						
81	SH	a			(HEX)	(HEX)						
82	SX	b			(HEX)	(HEX)						
83	EX	c			(HEX)	(HEX)						
84	ET	d			(HEX)	(HEX)						
85	EQ	e			(HEX)	(HEX)						
86	AK	f			(HEX)	(HEX)						
87	BL	g			(HEX)	(HEX)						
88	BS	h			(HEX)	(HEX)						
89	HT	i			(HEX)	(HEX)						
8A	LF	(HEX)			(HEX)	(HEX)						
8B	VT	(HEX)			(HEX)	(HEX)						
8C	FF	(HEX)			(HEX)	(HEX)						
8D	CR	(HEX)			(HEX)	(HEX)						
8E	SO	(HEX)			(HEX)	(HEX)						
8F	SI	(HEX)			(HEX)	(HEX)						
90	DL	(HEX)			(HEX)	(HEX)						
91	D1	j			(HEX)	(HEX)						
92	D2	k			(HEX)	(HEX)						
93	D3	l			(HEX)	(HEX)						
94	D4	m			(HEX)	(HEX)						
95	NK	n			(HEX)	(HEX)						
96	SY	o			(HEX)	(HEX)						
97	EB	p			(HEX)	(HEX)						
98	CN	q			(HEX)	(HEX)						
99	EM	r			(HEX)	(HEX)						
9A	SB	(HEX)			(HEX)	(HEX)						
9B	EC	(HEX)			(HEX)	(HEX)						
9C	FS	(HEX)			(HEX)	(HEX)						
9D	GS	(HEX)			(HEX)	(HEX)						
9E	RS	(HEX)			(HEX)	(HEX)						
9F	US	(HEX)			(HEX)	(HEX)						

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INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE HEX	REV EBCD CBA8421		BAUDOT		SELECTRIC	
			DS	US			DS	US	LETTERS	FIGURES	DS	US
A0	(SPACE)	(HEX)			(HEX)	(HEX)						
A1	!	~			(HEX)	(HEX)						
A2	"	s			(HEX)	(HEX)						
A3	#	t			(HEX)	(HEX)						
A4	$	u			(HEX)	(HEX)						
A5	%	v			(HEX)	(HEX)						
A6	&	w			(HEX)	(HEX)						
A7	'	x			(HEX)	(HEX)						
A8	(	y			(HEX)	(HEX)						
A9	)	z			(HEX)	(HEX)						
AA	*	(HEX)			(HEX)	(HEX)						
AB	+	(HEX)			(HEX)	(HEX)						
AC	,	(HEX)			(HEX)	(HEX)						
AD	-	(HEX)			(HEX)	(HEX)						
AE	.	(HEX)			(HEX)	(HEX)						
AF	/	(HEX)			(HEX)	(HEX)						
B0	0	(HEX)			(HEX)	(HEX)						
B1	1	(HEX)			(HEX)	(HEX)						
B2	2	(HEX)			(HEX)	(HEX)						
B3	3	(HEX)			(HEX)	(HEX)						
B4	4	(HEX)			(HEX)	(HEX)						
B5	5	(HEX)			(HEX)	(HEX)						
B6	6	(HEX)			(HEX)	(HEX)						
B7	7	(HEX)			(HEX)	(HEX)						
B8	8	(HEX)			(HEX)	(HEX)						
B9	9	(HEX)			(HEX)	(HEX)						
BA	:	(HEX)			(HEX)	(HEX)						
BB	;	(HEX)			(HEX)	(HEX)						
BC	<	(HEX)			(HEX)	(HEX)						
BD	=	(HEX)			(HEX)	(HEX)						
BE	>	(HEX)			(HEX)	(HEX)						
BF	?	(HEX)			(HEX)	(HEX)						

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INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS-3	IPARS INPUT = REVERSE HEX	REV EBCD CBA8421		BAUDOT		SELECTRIC	
			DS	US			DS	US	LETTERS	FIGURES	DS	US
C0	@	{			(HEX)	(HEX)						
C1	A	A			(HEX)	(HEX)						
C2	B	B			(HEX)	(HEX)						
C3	C	C			(HEX)	(HEX)						
C4	D	D			(HEX)	(HEX)						
C5	E	E			(HEX)	(HEX)						
C6	F	F			(HEX)	(HEX)						
C7	G	G			(HEX)	(HEX)						
C8	H	H			(HEX)	(HEX)						
C9	I	I			(HEX)	(HEX)						
CA	J	(HEX)			(HEX)	(HEX)						
CB	K	(HEX)			(HEX)	(HEX)						
CC	L	(HEX)			(HEX)	(HEX)						
CD	M	(HEX)			(HEX)	(HEX)						
CE	N	(HEX)			(HEX)	(HEX)						
CF	O	(HEX)			(HEX)	(HEX)						
D0	P	}			(HEX)	(HEX)						
D1	Q	J			(HEX)	(HEX)						
D2	R	K			(HEX)	(HEX)						
D3	S	L			(HEX)	(HEX)						
D4	T	M			(HEX)	(HEX)						
D5	U	N			(HEX)	(HEX)						
D6	V	O			(HEX)	(HEX)						
D7	W	P			(HEX)	(HEX)						
D9	Y	R			(HEX)	(HEX)						
DA	Z	(HEX)			(HEX)	(HEX)						
DB	[	(HEX)			(HEX)	(HEX)						
DC	\	(HEX)			(HEX)	(HEX)						
DD	]	(HEX)			(HEX)	(HEX)						
DE	^	(HEX)			(HEX)	(HEX)						
DF	UNDERLINE	(HEX)			(HEX)	(HEX)						

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INPUT HEX	ASCII	EBCDIC	EBCD C1248AB		XS 3	IPARS INPUT = REVERSE HEX	REV EBCD CBA8421		BAUDOT		SELECTRIC	
			DS	US			DS	US	LETTERS	FIGURES	DS	US
E0	`	\			(HEX)	(HEX)						
E1	a	(HEX)			(HEX)	(HEX)						
E2	b	S			(HEX)	(HEX)						
E3	c	T			(HEX)	(HEX)						
E4	d	U			(HEX)	(HEX)						
E5	e	V			(HEX)	(HEX)						
E6	f	W			(HEX)	(HEX)						
E7	g	X			(HEX)	(HEX)						
E8	h	Y			(HEX)	(HEX)						
E9	i	Z			(HEX)	(HEX)						
EA	k	(HEX)			(HEX)	(HEX)						
EB	k	(HEX)			(HEX)	(HEX)						
EC	l	(HEX)			(HEX)	(HEX)						
ED	m	(HEX)			(HEX)	(HEX)						
EE	n	(HEX)			(HEX)	(HEX)						
EF	o	(HEX)			(HEX)	(HEX)						
F0	p	0			(HEX)	(HEX)						
F1	q	1			(HEX)	(HEX)						
F2	r	2			(HEX)	(HEX)						
F3	s	3			(HEX)	(HEX)						
F4	t	4			(HEX)	(HEX)						
F5	u	5			(HEX)	(HEX)						
F6	v	6			(HEX)	(HEX)						
F7	w	7			(HEX)	(HEX)						
F8	x	8			(HEX)	(HEX)						
F9	y	9			(HEX)	(HEX)						
FA	z	(HEX)			(HEX)	(HEX)						
FB	{	(HEX)			(HEX)	(HEX)						
FC	|	(HEX)			(HEX)	(HEX)						
FD	}	(HEX)			(HEX)	(HEX)						
FE	~	(HEX)			(HEX)	(HEX)						
FF	(PAD)	(HEX)			(HEX)	(HEX)						

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APPENDIX C
CONTROL CHARACTER MNEMONICS

AK	ACK: Acknowledgment
BL	BEL: Bell
BS	Backspace
CN	CAN: Cancel
CR	RETURN: Carriage return
D1	DC1: Device control 1
D2	DC2: Device control 2
D3	DC3: Device control 3
D4	DC4: Device control 4
DL	DLE: Data link escape
EB	ETB: End of transmission block
EC	Escape
EM	EOM: End of message
EQ	ENQ: Enquiry
ET	EOT: End of transmission
EX	ETX: End of text
FF	Form feed
FS	Field separator

GS	Group separator (or Interchange group separator)
HT	Horizontal tabulate
LF	Line feed
NK	NAK: Negative acknowledgment
NU	Null
Pad	DEL (delete) or idle line
RS	Record separator
SB	SUB: Substitute
SH	SOH: Start of header
SI	Shift in
SO	Shift out
SX	STX: Start of text
SY	SYN: Synchronization character
US	Unit separator
VT	Vertical tabulate

APPENDIX D
MESSAGES TO OPERATOR

Message and Code	Comments
BAD SOURCE SELECTION	This message should not appear. If it does, contact ARC.
Beginning Of Test	On PROTOCOL SPREADSHEET Screen, indicates the boundary of a test. Move cursor down, or insert states or triggers.
BLOCK NOT FOUND (14)	Block specified cannot be found because tape has not been fully recorded or formatted.
BLOCK NOT PROGRAM TYPE	COMSTATE II has attempted to receive first block of a program during remote transfer but has found incompatible data.
(XXX) BLOCKS RECEIVED	During remote transfer, the destination has successfully received the number of blocks indicated.
(XXX) BLOCKS TRANSMITTED	Message appears on source unit to indicate the number of blocks successfully transmitted during a remote transfer.
BLOCK UNAVAILABLE	The block indicated for a SAVE operation already contains data or cannot be written to.
BLOCK UNAVAILABLE -- BAD	Block specified for a SAVE operation has previously been marked bad and cannot be used.

(cont.)

Message and Code	Comments
(XXX) BLOCKS SAVED	Number of blocks indicated have successfully been saved to tape.
BOARD "G" (MEMORY OPTION) NOT INSTALLED!	Board G has failed or been disconnected after power-up (not recommended procedure) and a memory command has been attempted. Power down and verify that cable to memory board is connected properly and memory board is seated in connector.
BOARD "G" PAGE ADDRESS SELECT ERROR	Failure of the logic that finds a block other than zero. Board may, possibly, still be usable to record, play back, or transfer starting from Block 000.
BUFFER OVERFLOW	Data received has exceeded print buffer capacity. Occurs when capture memory is being printed, and the tape speed selected is higher than the printer speed.
CAPTURE MEMORY FULL	RAM: Indicates that STOP AT END has been SELECTED and recording has stopped at end of RAM.
CHECKING TAPE TYPE	Tape is being read to determine whether a Program-Data or a Program Only Tape is installed.
CIM COMP ERROR (JR) CIM COMP ERROR (UN)	These messages should not appear. If either one does, call ARC.
CONDITIONING DESTINATION TAPE	The destination tape for a duplication is being retensioned.
CONDITIONING TAPE	The tape presently inserted is being retensioned.
Constant definition invalid for field	Indicates that the value of a constant is illegal in a particular field.

(cont.)

Message and Code	Comments
Constant expansion exceeds field size	Indicates that the value of a constant (or a string of constants, or the combination of a constant and a numeric entry) is too long for a menu field.
Constant requested but not defined	Indicates that a constant has been entered on a trigger or message menu but has not been defined on the Parameter C menu.
CRT/TAPE valid only in MON mode	CRT/TAPE cannot be used as a source when EMulate DTE or EMulate DCE has been selected on the Parameter 1 menu.
DATA NOT TAPE OR CRT	COMSTATE II has been prepared to receive on tape either taped data (TAPE) or CRT-DATA. Remote transfer has failed because source data is incompatible.
DATA TAPE INSTALLED	Attempt has been made to send or receive a TEST or SETUP with a data tape installed. Operation requires Program-Only tape.
DATA TYPE NOT SUPPORTED	The Data being received at the Printer/Remote interface cannot be displayed by this unit.
DIRECTORY SAVED	Program Tape Directory has been updated following a save operation, a delete operation, or a program transfer to the tape.
DIRECTORY VERSION NOT SUPPORTED	The directory read from tape cannot be converted to the format of the particular unit being used.
DIR NOT FROM THIS TAPE	Directory shown is for previous tape. Update directory for installed tape by pressing PROGRAM, followed by LOAD PROG or SAVE PROG.

(cont.)

Message and Code	Comments
DIRECTORY WRITE ERROR (20)	After two tries, the directory could not be verified when read back from the tape after being written.
TAPE RECORD OVERRUN (13)	Internally, the logic of the unit sent data too fast to the tape unit while it was writing a block. This should never occur. Contact Atlantic Research Corporation if you receive this error message.
DUPLICATING TAPE	Tape duplication (reading data, writing data, formatting tape, conditioning tape, or waiting for a tape exchange) is in progress.
END OF CAPTURE MEMORY	When receiving a Remote Transfer, displayed when data tape ends. In receive mode, data tape does not loop to beginning.
END OF MEMORY: XXX BLOCKS TRANSFERRED	In transfer from RAM to tape, end of memory encountered before last block to be transferred is reached. (No more data to transfer.) In transfer from tape to RAM, memory full before all specified blocks have been transferred.
End Of Test	On PROTOCOL SPREADSHEET Screen, indicates the boundary of a test. Move cursor up, or add states or triggers.
FIRST BLOCK NOT CRT DATA	The operator has attempted to send CRT-DATA from TAPE, but the tape contained another type of data.
FORMATTING DESTINATION TAPE	The destination tape for a duplication is being formatted.
FORMATTING TAPE	The tape presently inserted is being formatted as selected.
FUNCTION NOT INSTALLED	Function is selectable but is not present in this device.

(cont.)

Message and Code	Comments
INCOMPLETE PROGRAM	COMSTATE II has attempted to load a program which did not contain the anticipated amount of data. A partial program has been loaded.
INCORRECT PROGRAM NUMBER	COMSTATE II has attempted to load a multi-block program with an incompatible format.
INSERT DESTINATION (WRITE ENABLED) TAPE	The operator is asked to insert the tape to be written to during a duplication.
INSERT SOURCE (WRITE PROTECTED) TAPE	The operator is being asked to insert the tape which is to be read from during a duplication.
INTERNAL ERROR (CIM)	This message should not appear. If it does, contact ARC.
INTERNAL ERROR (Invalid Constant Type Byte)	This message should not appear. If it does, contact ARC.
INTERNAL ERROR (OIM)	This message should not appear. If it does, contact ARC.
INVALID CIM RESPONSE	This message should not appear. Contact ARC if it does.
INVALID COUNTER/TIMER PRINTER FIELD	Illegal entries have been made at the bottom of the Statistics Menu in the fields specifying timers and counters to be printed.
INVALID MEMORY COMMAND	Indicates communication error between Board C and Board F. (Unlikely to be seen).
INVALID PROGRAM NUMBER	The operator has entered a program number of 0 (load program) or greater than 100 (load or save program).
INVALID PROM BANK SELECT	Incorrect or non-existent memory bank has been selected. Contact ARC if this error persists.

(cont.)

Message and Code	Comments
INVALID STATE NAME	Indicates a space in a state name, or a non-existent state referenced on a trigger action menu.
INVALID TAPE COMMAND (05)	Indicates communication error between Board C and Board F. (Unlikely to be seen.)
LOADING DIRECTORY	The unit is loading the directory read from the Tape Control Module to the Operator Interface Module and formatting it for display on the CRT.
LOADING PROGRAM	The program read from the tape is being loaded into the Operator Interface Module from the Tape Control Module and stored in memory.
MEMORY BLOCK NOT FOUND - MAX BLK # = XXX	RAM block number selected for recording or playback is too large. For 128k RAM option, the maximum block number is 054. Also will occur if RAM-to-tape transfer XFER FROM BLOCK is too large or if tape-to-RAM transfer STARTING AT BLOCK is too large.
NO PGM/DIR FOUND	An attempt to load or save a program has failed because the COMSTATE II detects no Program Tape Directory or no program on the tape.
NO PROGRAM FOUND (04)	Program-Data Tape contains no recorded INTERVIEW COMSTATE II program. For Program-Only Tape, no program has been recorded in the program record specified to be loaded.

(cont.)

Message and Code	Comments
NO RECEIVER RESPONSE	During an AUTOMATIC Remote Transfer, displayed by the source INTERVIEW when it has stopped receiving acknowledgments from the destination INTERVIEW and has aborted the transmission; or when CTS is not received within 1 second after RTS driven ON.
NOT SETUP TO RECV DATA	The INTERVIEW is set to receive a Test or Setup, but is receiving Data.
OIM COMP ERROR (JR) OIM COMP ERROR (UN)	These messages should not appear. Contact ARC if either of these errors occurs.
POSITIONING TAPE	Tape is being moved to specified Start Block before transfer is initiated.
PREMATURE END OF DATA	Record received in Remote Transfer is shorter than specified by its header.
PROGRAM LOADED	A program has been successfully read from the tape and loaded into the program storage memory for use.
PROGRAM SAVED	A program has been successfully written onto a Program-Data Tape and verified.
PROG ONLY TAPE INSTALLED	Remote Transfer of data or CRT-DATA cannot be performed because a Program-Only Tape is installed. Replace the tape with a Program-Data Tape before performing the transfer.
PROGRAM TAPE INSTALLED	A Program-Only Tape was read by the unit during the power-up tape read. Since it is not known which program should be used for the automatic power-up, read program, and run procedure, nothing is done.

(cont.)

Message and Code	Comments
PROGRAM TAPE INSTALLED (21)	A Program-Only Tape has been left in the unit when RUN has been pressed and record either is selected or could be selected via a trigger. Recording to tape is not allowed.
PROGRAM TOO COMPLEX	States in both Tests A and B contain too many multiple trigger conditions and actions; or both tests contain too many large or complex states. Simplify the program by breaking down large, complex states into smaller states, or divide the program into a series of smaller programs. (See also PROGRAM TOO COMPLEX and XMIT TOO COMPLEX.)
PROGRAM TOO LONG (or PROGRAM TOO LARGE)	There is not enough room on the tape for the program you are attempting to save. A Program-Data Tape has room for one block of five triggers with up to five named states. (Capacity is reduced if a user code or constants are saved with the program.) A Program-Only Tape can hold 100 blocks. Tapes formatted on an older INTERVIEW 4500 or 4600 cannot store programs which exceed one block.
PROG TYPE NOT SUPPORTED	Program cannot be loaded because source device is incompatible with destination device. This message also appears if a Program-Data Tape with no program is installed when the unit is powered up.
PROGRAM VERSION NOT SUPPORTED	The program read from the tape cannot be converted to the format of the particular unit being used.
PROGRAM WRITE ERROR (19)	After two tries, the program could not be verified after it was written onto the tape.

(cont.)

Message and Code	Comments
RAM TO TAPE TRANSFER ERROR	RAM-to-tape transfer has wrapped past the end of memory and encountered the end of memory again before reaching last block to be transferred. Probable failure of end-of-memory detect logic.
RECEIVED	The INTERVIEW has received a Remote Transfer.
RECEIVING	The INTERVIEW is ready to receive or is receiving a Remote Transfer.
RECORD CHECKSUM ERROR	In Remote Transfer, a record has been received, but it contained errors and could not be used.
Recursive constant definition	A constant has been used to define itself.
REMOVE DESTINATION (WRITE ENABLED) TAPE	The operator is being asked to remove the tape which is to be written to during a duplication.
REMOVE SOURCE (WRITE PROTECTED) TAPE	The operator is being asked to remove the tape which is to be read from during a duplication.
REWIND ATTEMPT FAILED (03)	Tape may have run off reel, or has been removed.
RVRS INTERRUPT RECEIVED	A reverse interrupt was received during a remote transfer but could not be handled internally. This message should not appear on a device which is functioning normally. Contact ARC if it appears.
SAVE ERR -- BLK MARKED BAD	Program could not be saved because a bad block was detected and then marked bad.
SAVED	A program and directory or just a directory has been successfully written onto a Program-Only Tape and verified.

(cont.)

Message and Code	Comments
SAVING BLOCK	The COMSTATE II is in the process of saving a program block to tape.
SAVING DATA BUFFER	The COMSTATE II is saving on tape the CRT data which is currently stored in the buffer.
SAVING DIRECTORY	The current directory (with a new entry if a program is being saved) is being written onto a Program-Only Tape.
SAVING PROGRAM	The program currently in the unit is being written onto either a Program-Data or Program-Only Tape.
State Already Has 8 Triggers	On PROTOCOL SPREADSHEET Screen, indicates that the maximum number of triggers in a state has been exceeded.
STATE TOO COMPLEX	Indicates that too many multiple trigger conditions and actions have been selected in a given state. (See also XMIT TOO COMPLEX.)
TAPE BLOCK NOT FOUND	The specified program recorded could not be found on the tape installed. This can occur if the tape drive has a mechanical problem or if the tape has lost data.
TAPE CHECKSUM ERROR TAPE CHECKSUM ERROR (17)	Logic could not read program from tape. For a Program-Only Tape, a checksum error has been detected on a program or directory stored on tape before load point. When this message appears several times after SAVE PROGram is operated the tape may be defective, or the tape head may need cleaning.
TAPE CONDITIONED	Retensioning of the tape installed has been completed.

(cont.)

Message and Code	Comments
TAPE CRC ERROR (18)	A program has been found in the specified program record of a Program-Only Tape, but a CRC error was detected during reading.
TAPE DCE BUFFER OVERFLOW (06)	The internal buffers for DCE data have overflowed before they could be written to the tape.
TAPE DTE BUFFER OVERFLOW (07)	The internal buffers for DTE data have overflowed before they could be written to the tape.
TAPE FORMAT ERROR -- INVALID BLOCK SIZE	Tape-to-RAM transfer attempted from tape other than INTERVIEW Program-Data data tape. Or defective tape (or tape read error).
TAPE IS OFF REEL (56)	The tape in the cartridge installed has either run off one of the reels or is positioned with a position detection hole directly over the hole sensor.
TAPE IS WRITE PROTECTED (02)	RECORD command has been given while tab on tape is in protected position.
TAPE IS WRITE PROTECTED (42)	An attempt has been made to save a program onto a tape with the tape tab in the protected position.
TAPE NOT INSTALLED (01) TAPE NOT INSTALLED (41)	Power-up display. Will also appear if tape load point hole is over tape hole sensor, or if tape operation has been attempted with no tape inserted.
TAPE PLAY OVERRUN (10)	While reading a block, the tape unit read data from the tape faster than the logic could put it in the internal DCE and DTE buffers.
TAPE PLAY OVERRUN (12)	If EIA lead status has been recorded, maximum playback speed is 9.6 kbps.

(cont.)

Message and Code	Comments
TAPE PLAY UNDERRUN (09)	Data is not being passed from the internal DCE buffer to the line fast enough to keep up with the selected data rate.
TAPE PLAY UNDERRUN (11)	Data is not being passed from the internal DTE buffer to the line fast enough to keep up with the selected data rate.
TAPE POSITION ERROR (15)	Tape is positioned between two sets of warning holes at either the beginning or end of the tape. The situation may be corrected by making sure at least one set of double holes (beginning of tape) is wound onto the takeup reel (righthand reel) and then playing the tape from Block 000. (Error results from attempting to record or play from block other than zero if tape is stopped between beginning of tape and load point or beyond early warning at far end of tape.)
TAPE RECORD UNDERRUN (08)	Internally, the logic of the unit did not send data fast enough to the tape unit while it was writing a block.
TAPE STOPPED @ END	Indicates that STOP AT END has been selected and recording has stopped at end of tape.
TAPE STOPPED @ END: XXX BLOCKS TRANSFERRED	RAM-to-tape transfer has filled tape before all specified blocks have been transferred.
TAPE TO RAM TRANSFER MODE X FORMAT ERROR	X = 1, 2, or 3. Tape block format does not match standard INTERVIEW data format. (Mode 1 is data only. Modes 2 and 3 are data with RS-232/V.24 information.)
TOO MUCH DATA RECEIVED	The record received is longer than specified by its header.
TRANSMISSION ABORTED	Displayed by destination INTERVIEW when a Remote Transfer has been aborted by the source unit.

(cont.)

Message and Code	Comments
TRANSMITTED	The INTERVIEW has finished sending a Remote Transfer.
TRANSMITTING	The INTERVIEW is transmitting a poll and expecting to receive CTS ON. When CTS ON is received, a decrementing hexadecimal number will appear at the right of the Status field indicating that transmission is in progress.
Trigger Already Has 14 Lines	On PROTOCOL SPREADSHEET Screen, indicates that the maximum window size for a trigger has been exceeded.
Trigger Truncated	Entries made on trigger menu exceed maximum display size of PROTOCOL SPREADSHEET.
UNKNOWN ADDENDUM BLOCK ACTION	This message should not appear. If it does, contact ARC.
UNKNOWN ERROR CODE	An internal software error has occurred. This message should not appear on a device which is functioning normally.
UNKNOWN RVRS INT TYPE	During a remote operation, the COMSTATE II has received an unrecognizable type of reverse interrupt and has aborted the operation.
VERIFYING BLOCK	The COMSTATE II is verifying that a block has been correctly saved to tape.
VERIFYING DIRECTORY	The Program-Only Tape directory is being read back after being written to assure that it was written correctly.
VERIFYING PROGRAM	The program just written onto the tape is being read back to assure that it was written correctly.
XFER COMPLETE: XXX BLOCKS TRANSFERRED	RAM-to-tape or tape-to-RAM transfer successfully completed as specified.

(cont.)

Message and Code	Comments
XFER IN PROCESS: XXX BLOCKS TRANSFERRED	Displayed as transfer between tape and RAM is running. XXX is the count of blocks transferred from the SOURCE.
XMIT BUFFER OVERFLOW	Indicates that more than eight XMIT messages have been queued in the transmit buffer.
XMIT TOO COMPLEX	Transmit sequence is too complex for internal COMSTATE II tables to handle. For example, a series of messages with multiple Begin Frame or Begin Packet actions have been entered on a single trigger. Note that X.25 Modulo 128 messages require more space in the internal table, and that BSC/X.25 messages require even more. To compensate, simplify the strings to be transmitted by individual triggers. (See also PROGRAM TOO COMPLEX and STATE TOO COMPLEX.)

APPENDIX E
GLOSSARY OF GENERAL ACRONYMS AND ABBREVIATIONS

ASYNC	ASYNChronous format (indicates START and STOP bits)
AUTOSYNC	Automatically recognizes synchronization pattern as 16-bit pattern
AUX	Auxiliary
BCC	Block Check Calculation
BDLC	Burroughs Data Link Control
BISYNC	Binary Synchronous Communications Protocol (IBM); also BSC
BLI	BLInk (CRT enhancement)
BOP	Bit-Oriented Protocols, e.g., HDLC, bit stuffing
bps	bits per second
BSC	See BISYNC
CCITT	Consultative Committee, International Telephone and Telegraph
CHARS	CHARacterS
CRT	Cathode Ray Tube
CTS	Clear To Send (RS-232/V.24 signal)

D	D bit (Bit 7 in Octet 3 of packet-level X.25)
DB-25	25-Pin D connector (standard for RS-232/V.24)
DC	Don't Care character (keyboard key); also Device Control
DCE	Data Circuit-Terminating Equipment (or Data Communications Equipment)
DEC	DECrement
DLE	Data Link Escape (used principally in transparent BISYNC)
DSR	Data Set Ready (RS-232/V.24 control lead)
DTE	Data Terminal Equipment
EIA	Electronic Industries Association
EM	Emulate
FDX	Full Duplex (permits simultaneous data in both directions)
FCS	Frame Check Sequence (used in BOP)
Flag	HDLC 7E(hex) framing; the COMSTATE II's FLAG key
HDLC	High Level Data Link Control procedure (CCITT standard frame-level protocol; see X.25)
HDX	Half Duplex (data cannot be transmitted in both directions simultaneously)
HEX	Hexadecimal number; also the COMSTATE II's HEXadecimal key
Hz	Hertz
ID	IDentification
INC	INCrement
INFO	INFOrmation (usually refers to a type of frame)
kbps	Kilobits per second

LED	Light-Emitting Diode
LCN	Logical Channel Number (X.25 packet-level term)
LO	LOw intensity (CRT enhancement)
LRC	Longitudinal Redundancy Check
M	M bit (X.25 packet-level, Bit 4 of Octet 3)
MIL-188	Military Specification 188
MOD	MODulus (number of outstanding frames or packets, usually 8 or 128)
MON	MONitor mode
MSG	Message
N(R)	Number Received (frames)
NRZI	Non-Return to Zero Inverted (used with SDLC and ASYNC modems--sometimes with clocked modems)
N(S)	Number Sent (frames)
OUTSYNC	OUT of SYNChronization
P/F	Poll/Final bit used in control byte at frame level (X.25/SDLC)
P(R)	Packet Received
P(S)	Packet Sent
Q	Q bit (Bit 8 of Octet 1 in packet-level X.25)
RAM	Random Access Memory; the INTERVIEW COMSTATE II's high-speed memory option
RD	Received Data (RS-232/V.24 Signal)
REV	REVerse (black character on white background on CRT)
RI	Ring Indicator (RS-232/V.24 Signal)
RLSD	Received Line Signal Detect (RS-232/V.24 signal)

ROM	Read Only Memory (firmware/software storage)
RS-232/V.24	List of definitions for interchange circuit between data terminal equipment (DTE) and data circuit termination equipment (DCE) established by EIA
RTS	Ready To Send
SCT	Synchronous Clock, Transmit (RS-232/V.24 Signal)
SCTE	Synchronous Clock, Terminal (RS-232/V.24 Signal)
SCTS	Secondary Clear To Send (EIA Status Lead)
SCR	Synchronous Clock, Receive (RS-232/V.24 Signal)
SDLC	Synchronous Data Link Control (IBM); analogous to frame level
SNA	System Network Architecture (IBM)
SRD	Secondary Received Data (EIA Status Lead)
SRTS	Secondary Ready to Send (EIA Status Lead)
STD	Secondary Transmitted Data (EIA Status Lead)
SQ	Signal Quality (EIA Status Lead)
SY, SYNC	Abbreviations for synchronization character in the code set (SY used in CRT font)
SYNC	SYNChronous format (as distinct from ASYNC or X.25 or SDLC)
TD	Transmitted Data (RS-232/V.24 Signal)
TP	Test Point
TX	Transmit Message
UA	User-Assigned Lead (EIA Status Lead)
X.25	CCITT standard for packet-switching protocol (specifically level 3, the packet level; See HDLC)
XFER	Transfer
XMIT	Transmit; transmission

APPENDIX F
COMSTATE II INTERFACE SPECIFICATIONS

TABLE F-1
COMSTATE II MONITOR CONNECTOR

TW-932-018

Pin No.	Pin Name	Signal Description
1	Frame Ground	Ground
2	TD	High Impedance Input
3	RD	High Impedance Input
4	RTS	High Impedance Input
5	CTS	High Impedance Input
6	DSR	High Impedance Input
7	Signal Ground	Ground
8	RLSD	High Impedance Input
9	--	High Impedance Input Test Point
10	--	High Impedance Input Test Point
11	--	High Impedance Input Test Point
12	SRLSD	High Impedance Input
13	SCTS	High Impedance Input
14	STD	High Impedance Input
15	SCT	High Impedance Input
16	SRD	High Impedance Input
17	SCR	High Impedance Input
18	--	High Impedance Input Test Point
19	SRTS	High Impedance Input
20	DTR	High Impedance Input
21	SQ	High Impedance Input
22	RI	High Impedance Input
23	DSRS	High Impedance Input
24	SCTE	High Impedance Input
25	--	High Impedance Input Test Point

TABLE F-2
COMSTATE II EMULATE DCE CONNECTOR

TW-932-018

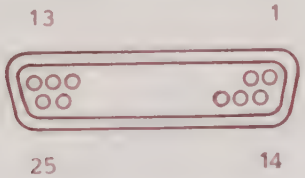
Pin No.	Pin Name	Signal Description
1	Frame Ground	Ground
2	TD	RS-232/V.24 Input
3	RD	RS-232/V.24 Output
4	RTS	RS-232/V.24 Input
5	CTS	RS-232/V.24 Output
6	DSR	RS-232/V.24 Output
7	Signal Ground	Ground
8	RLSD	RS-232/V.24 Output
9	--	RS-232/V.24 Input
10	--	RS-232/V.24 Input
11	--	RS-232/V.24 Input
12	SRLSD	RS-232/V.24 Input
13	SCTS	RS-232/V.24 Input
14	STD	RS-232/V.24 Input
15	SCT	RS-232/V.24 Output
16	SRD	RS-232/V.24 Input
17	SCR	RS-232/V.24 Output
18	--	RS-232/V.24 Input
19	SRTS	RS-232/V.24 Input
20	DTR	RS-232/V.24 Input
21	SQ	RS-232/V.24 Input
22	RI	RS-232/V.24 Output
23	DSRS	RS-232/V.24 Input
24	SCTE	RS-232/V.24 Input
25	--	RS-232/V.24 Input

TABLE F-3
COMSTATE II EMULATE DTE CONNECTOR

TW-932-018

Pin No.	Pin Name	Signal Description
1	Frame Ground	Ground
2	TD	RS-232/V.24 Output
3	RD	RS-232/V.24 Input
4	RTS	RS-232/V.24 Output
5	CTS	RS-232/V.24 Input
6	DSR	RS-232/V.24 Input
7	Signal Ground	Ground
8	RLSD	RS-232/V.24 Input
9	--	RS-232/V.24 Input
10	--	RS-232/V.24 Input
11	--	RS-232/V.24 Input
12	SRLSD	RS-232/V.24 Input
13	SCTS	RS-232/V.24 Input
14	STD	RS-232/V.24 Input
15	SCT	RS-232/V.24 Input
16	SRD	RS-232/V.24 Input
17	SCR	RS-232/V.24 Input
18	--	RS-232/V.24 Input
19	SRTS	RS-232/V.24 Input
20	DTR	RS-232/V.24 Output
21	SQ	RS-232/V.24 Input
22	RI	RS-232/V.24 Input
23	DSRS	RS-232/V.24 Input
24	SCTE	RS-232/V.24 Output
25	--	RS-232/V.24 Input

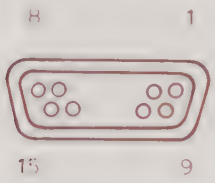
TABLE F-4
COMSTATE II PRINTER/REMOTE CONNECTOR



TW-932-018

Pin No.	Pin Name	Signal Description
1	Frame Ground	Ground
2	TD	RS-232/V.24 Input
3	RD	RS-232/V.24 Output
4	RTS	RS-232/V.24 Input
5	CTS	RS-232/V.24 Output
6	DSR	RS-232/V.24 Output
7	Signal Ground	Ground
8	RLSD	RS-232/V.24 Output
9		
10		
11		
12		
13		
14		
15	SCT	RS-232/V.24 Input
16		
17	SCR	RS-232/V.24 Input
18		
19		
20	DTR	RS-232/V.24 Input
21		
22		
23		
24		
25		

TABLE F-5
COMSTATE II AUXILIARY CONNECTOR



TW-932-019

Pin No.	Pin Name	Signal Description
1	--	Not connected
2	--	No current use (not connected)
3	--	No current use (not connected)
4	AUX OUT 3	Follows Flag F (see Note 1)
5	--	Not connected
6	--	Not connected
7	Ground	--
8	Ground	--
9	AUX OUT 2	Follows Flag E (see Note 1)
10	AUX IN 1	No current use
11	AUX OUT 1	Follows Flag D (see Note 1)
12	--	Not connected
13	--	not connected
14	Ground	--
15	Ground	--

NOTE 1: Driven by a 74LS04. When Flag = 1, output is +3.5 V; when Flag = 0, output is 0 V.

APPENDIX G
COMMUNICATIONS WITH THE ARC TELEPRODUCTS FACTORY

G.1 RETURNING AN INTERVIEW COMSTATE II OR SUBASSEMBLIES FOR REPAIR

G.1.1 Authorization

(1) The first step is always to call the ARC Teleproducts REPAIR CLERK in Springfield, Virginia: 703-644-9020.

(2) The Repair Clerk will give you a RETURN AUTHORIZATION NUMBER. This number should be posted on the outside of the package of all equipment returned for repair, and cited in all documentation, written correspondence, or telephone conversations concerning the specific repair.

(3) Turnaround time for repairs is usually two weeks in addition to transportation time. The Repair Clerk can arrange to furnish a rental unit if it is not practical for you to be without the equipment for that length of time. We can either include the rental fee on the repair bill or bill the rental fee separately.

G.1.2 Shipping

(1) Always include with the shipment a detailed description of the problem to be corrected. Put the assigned RETURN AUTHORIZATION NUMBER on this document.

(2) If the item is out of warranty, you should either

(a) authorize the amount of the repair in dollars;

(b) request an estimate of the amount of the repair.

(3) Select suitable packing materials for electronic equipment containing a cathode ray tube, and pack the COMSTATE II with care. If possible, the carton and foam packing material in which you received the equipment should be used for returning it for repairs.

(4) Write the RETURN AUTHORIZATION NUMBER on the outside of the shipment.

(5) Address the shipment to

REPAIR DEPARTMENT
Atlantic Research Corporation
Teleproducts Division
7401 Boston Boulevard
Springfield, Virginia 22153
U.S.A.

(6) Ship PREPAID. No collect shipments will be accepted unless previously authorized by the Repair Clerk.

(7) Most repairs will be completed within two weeks, not including transportation time.

G.2 ORDERING REPLACEMENT PARTS OR ASSEMBLIES

To obtain price quotations or to order spare or replacement parts, contact the REPAIR CLERK by telephone, 703-644-9020.

The Repair Clerk will need to know the model designation of the unit, its serial number and software version, and what options are already installed in it.

G.3 PC BOARD OR SUBASSEMBLY EXCHANGES

Contact the REPAIR CLERK to arrange to exchange PC Boards or Subassemblies that need repairs. The Repair Clerk can arrange to send you the replacement part immediately. You will then be responsible for the list price value of the part until ARC has actually received the returned part.

G.4 FOR ANALYSIS OF PROBLEMS

For assistance using ARC equipment in technical applications, call CUSTOMER SUPPORT, 703-644-9190.

For technical assistance with troubleshooting or repairing ARC equipment, call REPAIR DEPARTMENT at 703-644-9020.

G.5 WARRANTIES

There is a standard warranty on all ARC Teleproducts equipment. This warranty is for 12 months.

Extended Service Agreements are available on some equipment. Please contact the Repair Clerk, at 703-644-9020, for more information.

APPENDIX H
PACKING AND SHIPPING

The COMSTATE II is usually shipped either as baggage or as freight. The basic difference, of course, is in the quantity and quality of handling to which the COMSTATE II is subjected. It follows that different packing methods are called for.

H.1 USING THE PADDED TRAVEL BAG

When a unit is shipped as baggage, it will probably be subjected to much less severe treatment than when it is shipped by freight. Atlantic Research Corporation offers its COMSTATE II Option Padded Travel Bag, stock no. 37408, for this purpose. This bag has two inches of high-density foam protecting all surfaces of the COMSTATE II. It is yellow for easy identification among other luggage. An identification card case, FRAGILE markings, and leather appointments are standard features. Inside is a large pocket for carrying notes, manuals, and so forth. Do not use the padded insert when packing the COMSTATE II.

NOTE: There are additional packing instructions inside the lid of the travel bag.

Before packing the COMSTATE II in the carrying bag remove the tape from the drive. Fold the handle toward the bottom of the unit. Put cable and tapes in the top compartment of the COMSTATE II, but be sure that this compartment is not overpacked. The door should close and latch easily.

Don't overstuff the front pocket of the carrying bag. Only the manuals and the power cable should go in the front pocket. Pack it so the flat surface of the binder is against the bottom cover of the COMSTATE II. Objects such as connectors and plugs must not be packed between the binder and the COMSTATE II.

Put the COMSTATE II in the bag with the bottom of its case against the front pocket of the bag (as in Figure H-1). Secure the unit with the velcro tapes; then close and secure the bag cover with its velcro closing.

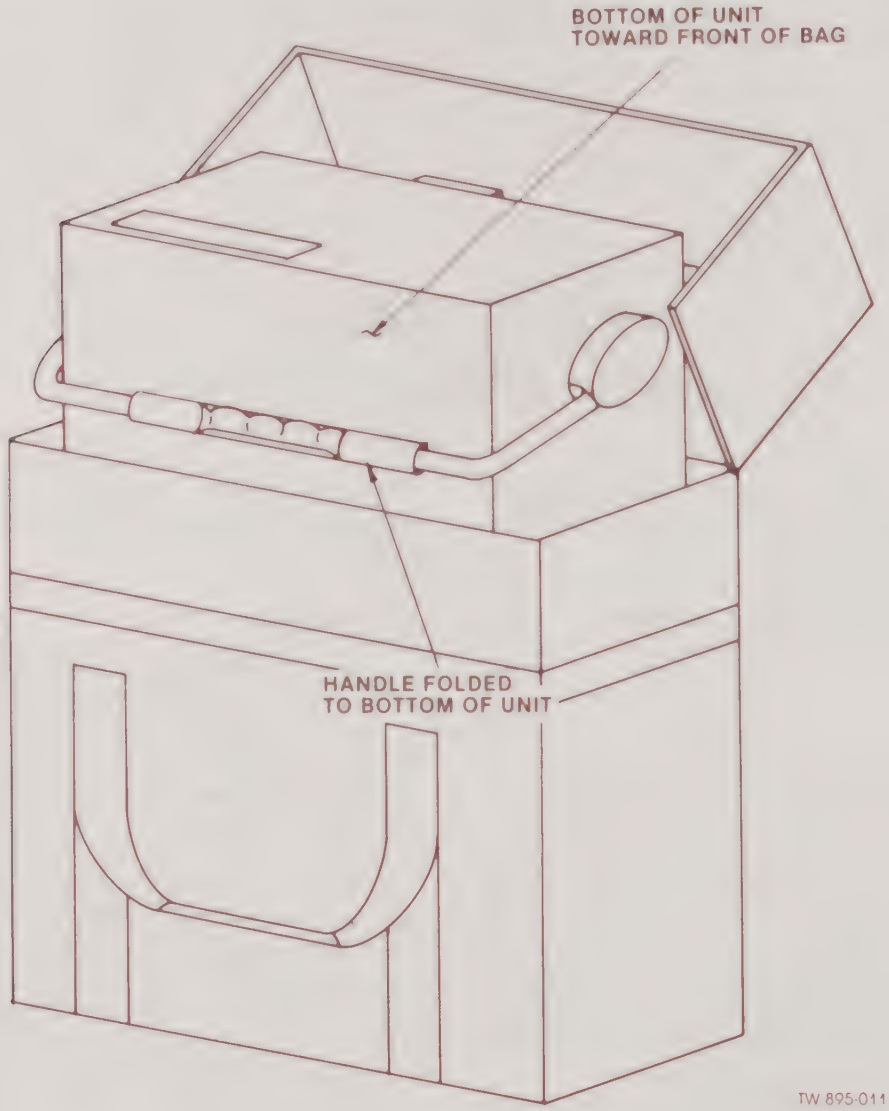

BOTTOM OF UNIT
TOWARD FRONT OF BAG
HANDLE FOLDED
TO BOTTOM OF UNIT
TW 895-011

Figure H-1

H.2 PHYSICAL DESCRIPTION AND USE OF THE HARD SHELL TRAVEL CASE

The hard shell travel case is made of high-impact plastic, steel and rubber parts. The ARC case resembles a large suitcase, and it works in much the same way. It makes transporting the COMSTATE II by hand easier. The case can also be used for packing other types of ARC test equipment. (Refer to Hardshell Travel Case Packing Instructions, TP-351A-1-85 for details.)

H.2.1 Opening and Closing the Case

(1) Refer to Figure H-2. To OPEN the case, first place the case on its BOTTOM side. Otherwise, your equipment might come tumbling out when you open it. Then, if you've locked the case -- two keys are provided with each unit, attached to the large handle at shipment -- unlock the two FRONT and one RIGHT side clasps. Now, pull up from the bottom of each clasp until it releases.

(2) Grasp the RIGHT and LEFT TOP sides of the case, using the LEFT rubber foot to get a good grip, and open the case until the top stops at a right angle to the bottom. It's designed to stay open in this position.

(3) When you're ready to CLOSE the case, simply reverse this procedure, moving the clasps over the upper catches and pulling them down until they latch. Lock the clasps if you wish.

H.2.2 Using the Cart Handle

(1) To use the CART HANDLE, first place the case on its LEFT side, resting on the four left rubber feet, with the small right SIDE HANDLE facing up.

(2) Place four of your fingers UNDER the rubber CART HANDLE and place your thumb on the case above the CART HANDLE LOCK GROOVE. Using thumb for leverage, pop the rubber CART HANDLE out of the LOCK GROOVE.

(3) Now that the handle is released, pull it up firmly until it snaps into its locked position. As the handle locks, the two WHEELS will also pop out. Now you're ready to go. Please note that the case steers more easily if you PULL it rather than push.

(4) When you're finished using the CART HANDLE mechanism, just push the handle down firmly until the rubber handle snaps back into the LOCK GROOVE. The WHEELS will automatically retract.

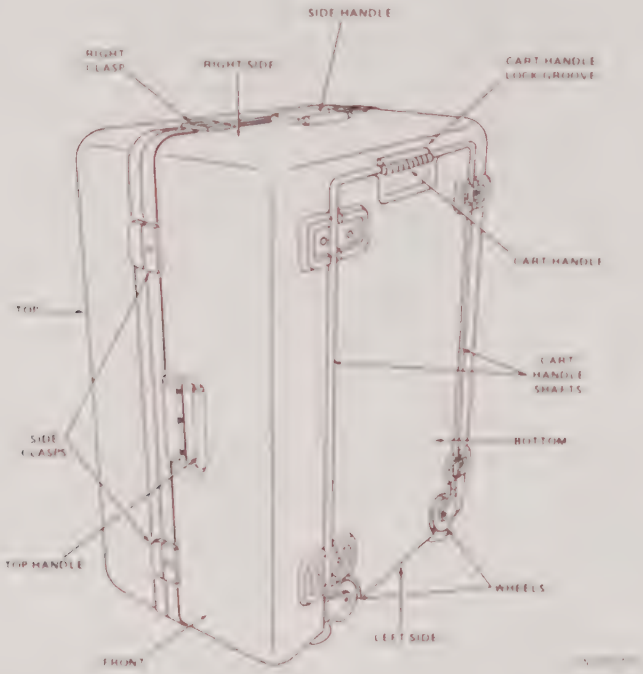


Figure H-2 ARC Hard Shell Travel Case, Front Angle View.

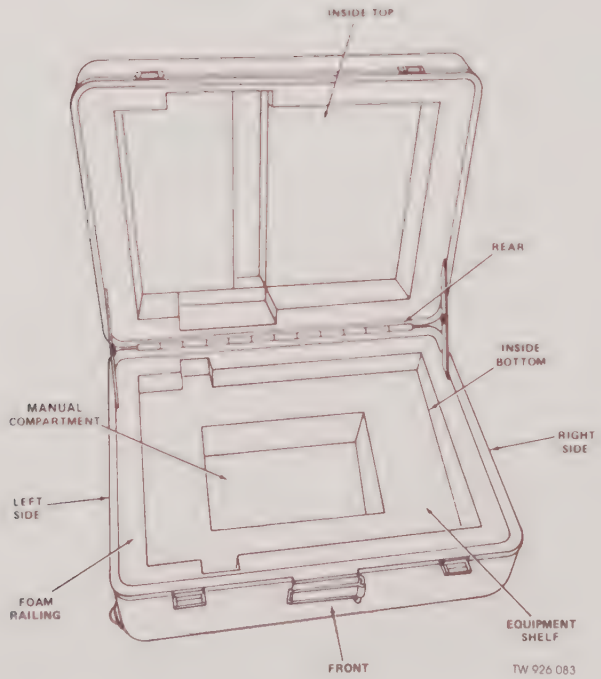


Figure H-3 Inside Front View of the Hard Shell Travel Case.

H.2.3 Packing the COMSTATE II in the Case

Following these instructions will insure that the COMSTATE II will not move around inside the case during transport.

NOTE: Before packing any equipment, make sure it's SECURELY CLOSED AND LATCHED.

(1) Packing the COMSTATE II doesn't require the use of foam inserts, unless you are transporting the COMSTATE II without manuals. (The packing of any other pieces of ARC test equipment will require use of the foam inserts which are included in the travel case.)

If you remove all inserts that aren't attached to the shell, your case will look like Figure H-3. The INSIDE BOTTOM contains a deep rectangular compartment called the MANUAL COMPARTMENT. This compartment will hold two manuals cradled firmly beneath the equipment. If you're bringing only one manual, or none, place the foam MANUAL INSERT (10-1/2 by 11-1/2 by 2 inches) in this compartment.

(2) To load equipment, the FRONT side of the case must face you, and the short side with four rubber feet and no handle must face LEFT.

(3) Normal carrying position for the handle is upright, above the locked keyboard. Push in the handle's side knobs, and click the handle into the first position toward the machine's TOP. Now push in the side knobs again, and move the handle so that it actually TOUCHES the TOP of the machine.

(4) Place the machine GENTLY into the case, with the keyboard facing the LEFT side of the case and the handle facing the TOP. The fit will be snug.

(5) GENTLY close the case and snap it shut.

CAUTION: The padded travel bag or the hard shell travel case is considered to be reasonable protection for the COMSTATE II when it is shipped as baggage. However, it should never be used for freight shipment. Atlantic Research Corporation can assume no liability for damage to units shipped this way, owing to circumstances beyond our control.

H.3 SHIPPING THE COMSTATE II AS FREIGHT

For freight shipment, the COMSTATE II should be packed in molded polyurethane foam and a heavy-duty outer cardboard carton, as delivered by Atlantic Research. All manuals and accessories should be packed in a separate box within the carton. This packing system has been designed to give maximum reasonable protection to the COMSTATE II and ensure its safe arrival. However, damages due to mishandling must be the responsibility of the carrier.

NOTE: Please do not return any unit to Atlantic Research Corporation without prior authorization (see Appendix G).

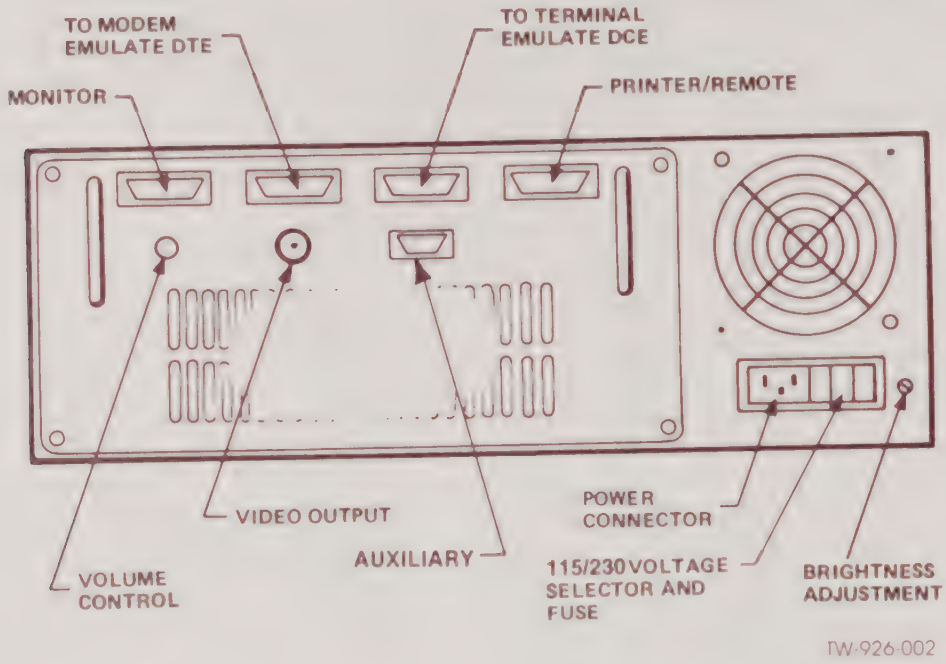


Figure I-1 Rear panel of COMSTATE II.

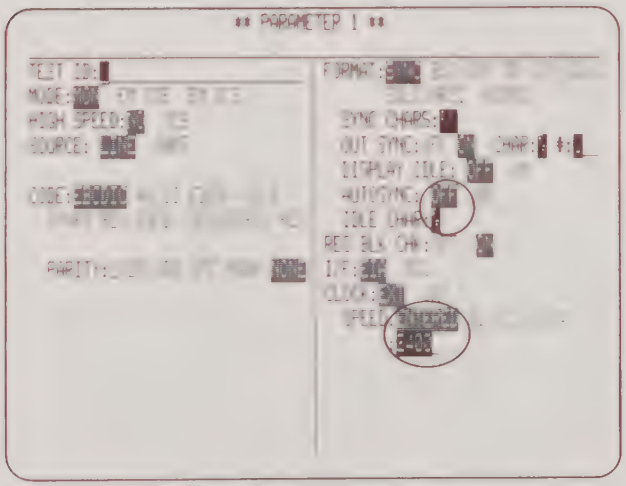


Figure I-2

APPENDIX I
ROUTINE SERVICE AND ADJUSTMENTS

The COMSTATE II requires very few adjustments and little routine service to assure satisfactory, trouble-free operation. This section describes the few procedures necessary. These procedures may be done by the operator under the supervision of a qualified electronics technician.

I.1 GENERAL CLEANING

The exterior surfaces may be cleaned with a soft damp cloth. Accumulations of dirt or fingerprints may be removed from the case or keyboard using a cloth dampened with a mild detergent. Do not use abrasive or solvent-type cleaners, which may damage the plastic surfaces.

I.2 VOLUME AND BRIGHTNESS ADJUSTMENTS

Volume and CRT brightness are easily adjusted by the operator to suit his particular operating environment or preferences. The speaker volume and CRT brightness controls are on the rear panel (see Figure I-1).

(a) Volume. The volume may be adjusted according to the background noise level at the work site. The volume control is mounted on the rear panel and has a knob for easy adjustment. This control adjusts the volume of the key confirmation and error tones and the trigger alarm. Rotating the volume control fully counterclockwise will silence the speaker.

(b) Brightness. The CRT brightness adjustment has been preset at the factory for optimum display brightness. If it becomes necessary to adjust the brightness, follow this procedure:

(1) Allow the CRT to warm up for at least 5 minutes.

(2) Depress the RUN key, and then PARAM followed by 1(numeral 1). The display should appear as in Figure I-2.

(3) The brightness control is located on the rear panel (see Figure I-1) next to the power connector-fuse holder. A small screwdriver is needed to turn it.

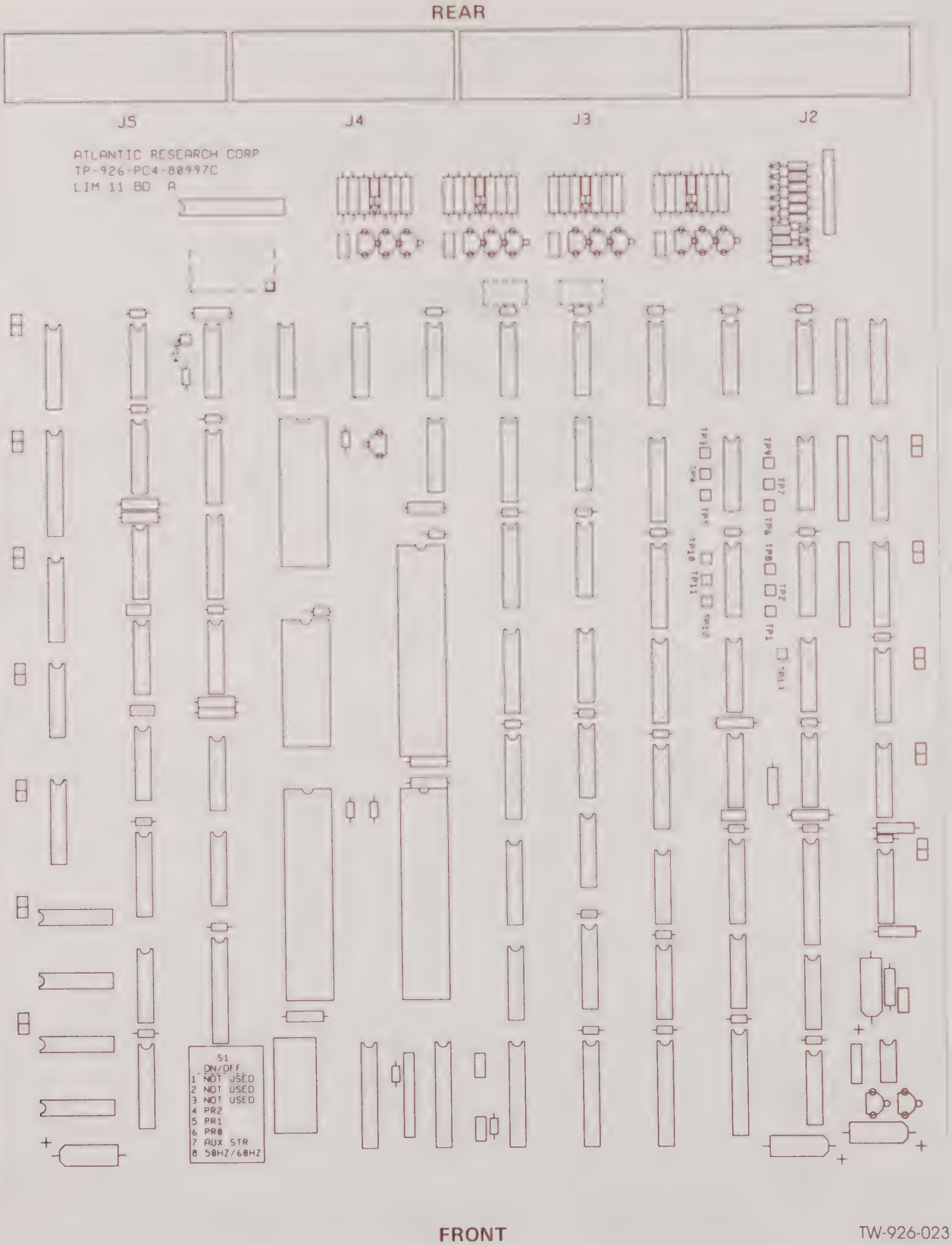


Figure I-3 COMSTATE II Line Interface Module (Board A).

Observing the display, increase the brightness until defocusing occurs. This will be most noticeable at the demarcation between high-intensity and low-intensity reverse-image fields (areas circled in Figure I-2). The edge of the high-intensity reverse area will appear to bleed into the low-intensity reverse area.

(4) Now back the brightness adjustment down just to the point that the defocusing or bleeding is eliminated. This is the maximum usable brightness setting. A higher setting will degrade the clarity of the display. If a lower setting is desired for a low ambient light environment, be careful not to reduce the brightness to the point that the low-intensity characters are illegible.

I.3 INTERNAL SWITCHES AND STRAPPING

CAUTION: Setting the internal switches or strapping the user-assigned lead on the Line Interface Module (Board A) should be performed only under supervision of qualified service personnel.

(a) Removing and Replacing the Line Interface Module. Disconnect the power cord. Loosen the four captive fasteners on the rear panel of the unit (Figure I-1); then pull out the panel and its attached board (Board A), sliding it in parallel with the top cover.

Before you replace the Line Interface module, check to see that the other PC boards are correctly seated in their connectors and card guides, and then install the line interface module, as follows: With the component side of Board A on top, slide the board squarely and gently into its card guides until the edge connector seats. If it does not seat easily, do not force the board in head on, but use alternate pressure on the handles at the right and left edges of the rear panel. When the board is engaged in its card guides and properly seated in the connector, tighten the captive screws.

(b) Switch S1. The settings of internal switch S1 on the Line Interface Module, should be checked before the COMSTATE II is operated. Switch S1 is located near the front of Board A (see Figure I-3). Compare this switch against Table I-1 for proper switch settings.

NOTE: Changing the power frequency setting (Switch S1-8) sometimes necessitates adjustment of the CRT vertical hold (see Appendix J).

(c) Strapping the User-Assigned Lead and Status Indicator. The User-Assigned lead (Test Point 14) can be strapped to any one of 13 RS-232/V.24 pins using test points on Board A. The UA lead comes from the factory strapped to the DTE TD line for X.21 operation.

Remove the Line Interface Module as explained above. Locations of the test points are shown in Figure I-3; Table I-2 correlates test point numbers with RS-232/V.24 pin numbers. Unwrap the UA connection. Then patch TP 14 to the desired test point or wire-wrap it using 28- or 30-gauge insulated wire.

CAUTION: Never connect TP 14 to more than one test point at a time.

NOTE: The AUX connector on the rear panel is used for X.21 and other operations.

TABLE I-1
DIP SWITCH SET S1, LIM BOARD

Switch	Setting
S1-1	OFF
S1-2	OFF
S1-3	OFF
S1-4	OFF
S1-5	OFF
S1-6	OFF
S1-7	OFF
S1-8	OFF for 60-Hz power frequency ON for 50-Hz power frequency

Note: Switches S1-1 through S1-7 must be OFF for proper operation. They are used only for testing by the factory.

I.4 PREVENTIVE OR ROUTINE MAINTENANCE OF TAPE DRIVE

The tape head and capstan should be cleaned at least every 8 hours of tape motion. The recording technique, however, prevents the tape from continuous motion during recording or playing back. In normal use at low data rates, monthly cleaning should be adequate. On the other hand, if the tape is used 24 hours a day at high data rates, daily cleaning may be necessary. Frequent visual inspection of the tape head is recommended under any operating conditions. The tape head can be seen easily through the cartridge window when the tape cartridge is removed. If inspection reveals any accumulation of oxide or dirt, the tape head should be cleaned. The tape hole sensor should be cleaned at the same time.

(a) Tape Head Cleaning. The tape head and capstan can be cleaned by reaching through the cartridge window. See Figure I-4.

CAUTION: The tape drive cover is labeled with the warning not to touch the metal timing disc. Do not attempt to clean the tachometer disc, and do not touch or bend the disc while cleaning the head or other parts of the drive.

Clean the tape head and capstan (the rubber drive wheel under the tachometer disk; see Figure I-4) with a cotton swab moistened with isopropyl alcohol or Miller-Stephenson Magnetic Tape Head Cleaner. Other solvents may damage the tape head or capstan.

CAUTION: Do not use rubbing alcohol, acetone, lacquer or paint thinners, or aerosol sprays.

Do not use an excessive amount of solvent and do not allow the solvent to reach the capstan bearings since this will destroy their lubrication.

CAUTION: Under no circumstances should the tape head mounting be moved since this will affect the operation of the recorder.

TABLE I-2
LINE INTERFACE MODULE STRAPPING FOR
USER-ASSIGNED INPUT LEAD

Pin No.	Connect TP 14 (Common) to
9	TP 1
10	TP 2
11	TP 3
12	TP 4
13	TP 5
14	TP 6
16	TP 7
18	TP 8
19	TP 9
21	TP 10
23	TP 11
24	TP 12
25	TP 13

(b) Tape Hole Sensor Cleaning. The tape hole sensor can be cleaned by reaching through the cartridge window (see Figure I-4). Any accumulation of dirt or dust on the lenses of both the emitter and the sensor should be cleaned with a soft brush or cotton swab. If the tape hole sensor is not cleaned at least once per month, a tape may run off its reel.

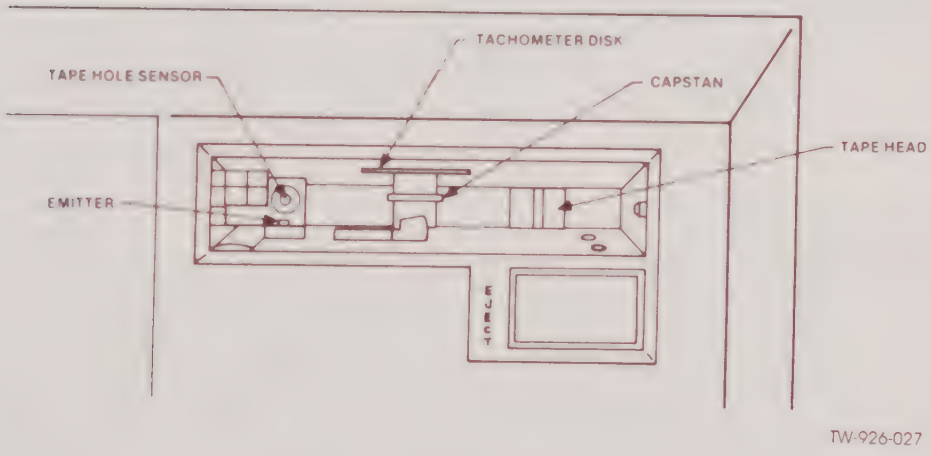


Figure I-4 Tape Drive.

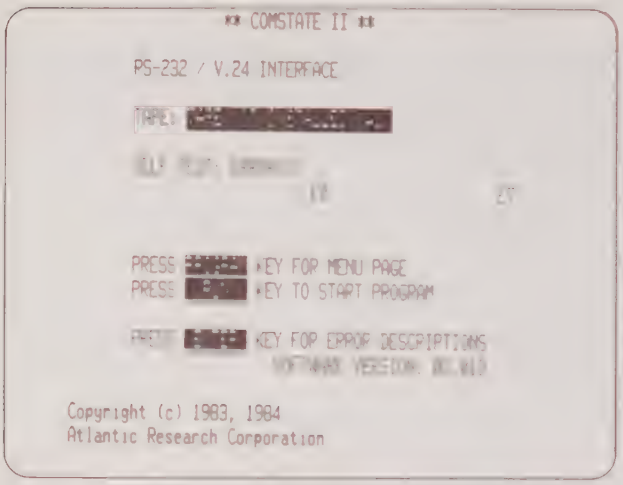

** COMSTATE II **
PS-232 / V.24 INTERFACE
PRESS [redacted] KEY FOR MENU PAGE
PRESS [redacted] KEY TO START PROGRAM
PRESS [redacted] KEY FOR ERROR DESCRIPTIONS
Copyright (c) 1983, 1984
Atlantic Research Corporation

Figure J-1

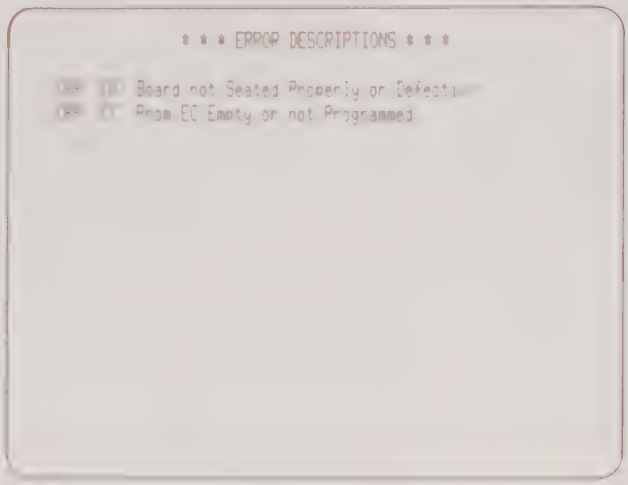


Figure J-2

APPENDIX J
TROUBLESHOOTING AND ADVANCED MAINTENANCE PROCEDURES

With the exception of the user adjustments described in Appendix J, all electrical adjustments are preset at the factory and should require readjustment only after extended periods of operation. The adjustments and other procedures described in this appendix should only be performed if there is good reason to believe they are required, and they should be attempted only by qualified service personnel.

If you need to contact Atlantic Research Corporation for further maintenance information or to return a part for repair, please follow the procedures explained in Appendix G.

J.1 POWER-UP SELF TESTS; COMPONENT EXCHANGES

Power up the unit with no tape in the drive.

CAUTION: There is no need to remove the top cover to check or exchange any of the boards referred to in this section.

When one or more SELF TEST error codes appear on the power-up screen (Figure J-1), press the ENTER key to see descriptions of the errors found (Figure J-2). Each code is a two digit (letter,number) string. The first digit is always a letter and indicates which board the error was found on:

D - OIM
E - CIM
F - TCM
G - HIGH SPEED RAM

The second digit is the error condition code:

0 - Board not seated or defective.
1 - Capture RAM error.
2 - State RAM error.
3 - System RAM error.
4 - Defective PROM or PROM checksum error.
5 - Invalid PROM or incorrect PROM revision.
6 - Requires another PROM which is not installed (options).
7 - Empty socket or PROM not programmmed.
8 - Self test aborted.

All the logic boards referred to are accessible through the rear of the unit as described in Appendix I.3(a). Correct installation of the boards is shown in Figure J-3.

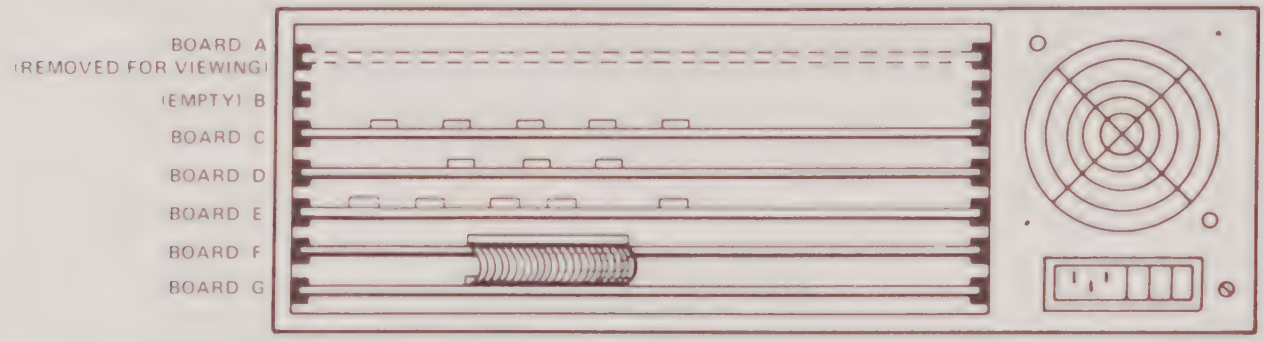


Figure J-3 Rear of COMSTATE II with Line Interface Module (Board A) removed.

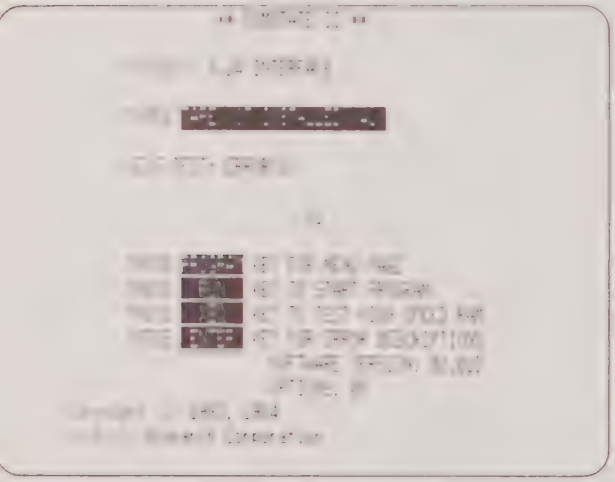


Figure J-4

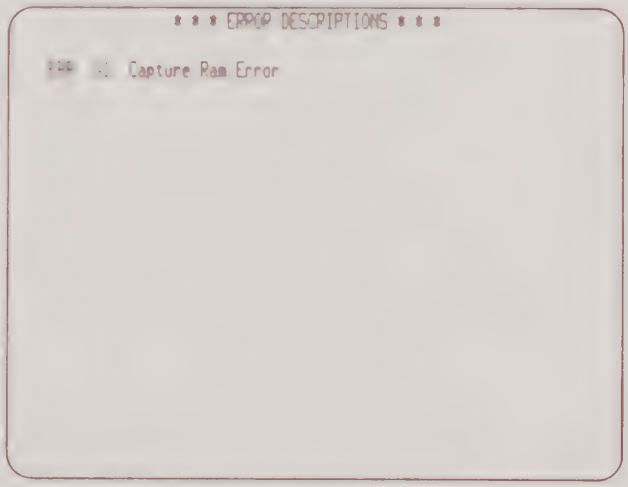


Figure J-5

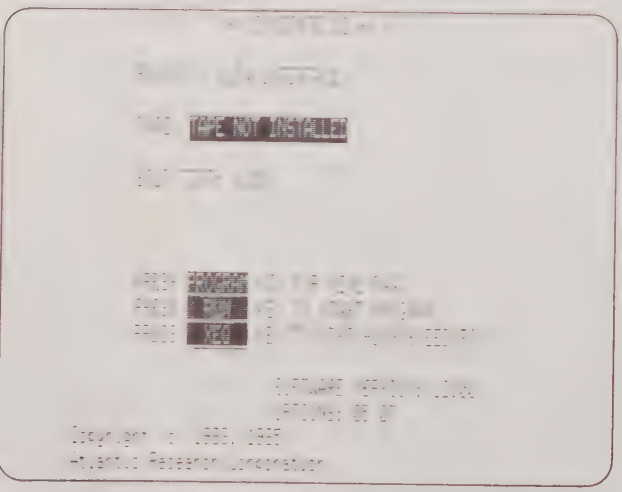


Figure J-6

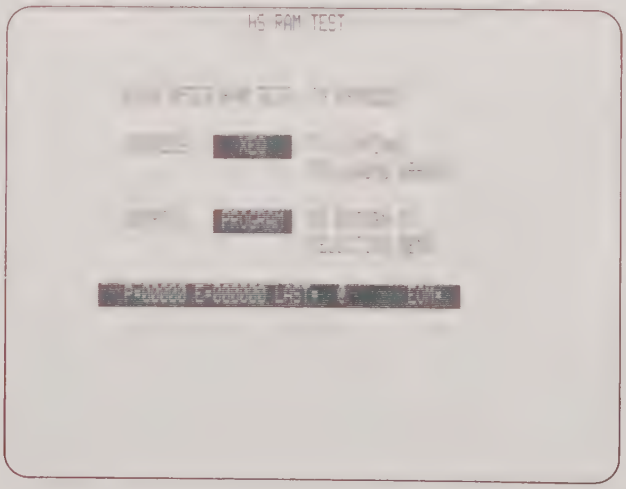


Figure J-7

When an error code and subsequent check indicate that a printed circuit logic board is defective, the best way to confirm the diagnosis is to insert another board of the same revision level, either a spare or one from another COMSTATE II. If this corrects the problem, the defective board can be returned to Atlantic Research Corporation for service.

NOTE: Do not return any unit or components to Atlantic Research Corporation without prior authorization.

When the probable cause is a defective or missing ROM, check first that all ROMs on the board are of the correct revision level. Then substitute ROMs known to be of the correct revision level using spares or borrowing from another unit. (Check with Atlantic Research Corporation if you are in doubt about the correct revision level.)

CAUTION: Remove and install ROMs carefully to avoid bending the pins.

If you can identify the defective ROM, order the replacement. If necessary make arrangements with ARC to return the board for service.

J.2 NO CIM SYNC ERROR

When NO CIM SYNC appears on the power-up display, Board E has been unable to complete minimum initialization necessary to perform power-up tests. The error must be corrected before any further testing is possible. Check that Board E is properly seated in its connector. If this does not solve the problem, there may be a defective, incorrect, or incomplete set of ROMs on Board E, or the board itself may be defective.

J.3 CRT DISPLAY

Board C is the CRT Driver Board. If the CRT display does not come up, connect a video monitor to the output on the rear of the unit. If you obtain a display on the auxiliary monitor, the fault is probably in the CRT or its immediate area; if no display appears, replace Board C with another of the correct revision level. If this solves the problem, make arrangements with ARC to return the defective board for service.

J.4 HIGH-SPEED MEMORY OPTION SELF TESTS

During power-up the COMSTATE II writes data into the RAM and verifies it. Error code G1 on the power-up display (Figure J-4) indicates that a RAM error has been found (Figure J-5). To localize the source of the error, conduct the following self tests.

(a) Procedure: Manually Controlled Test. With the power-up menu displayed (Figure J-6), press the dark gray XEQ key at the right of the keyboard. This displays the HS RAM TEST menu shown in Figure J-7 and starts the self tests. RAM test status is shown on the second line of this menu.

When the logic finds a RAM error, it halts the test and replaces the message HIGH SPEED RAM TEST IN PROCESS with HIGH SPEED RAM TEST HALTED (see Figure J-8). This allows you to record the status information for the last error found before the test is continued. Press XEQ again to continue the test.

The memory board contains two types of logic: Mode 1 logic and Mode 2 logic. Each test pass consists of four steps: Mode 1 write and read; and Mode 2 write and read.

(b) Procedure: Free-Running Test. If you press the XEQ key a second time before the test halts on an error, the test will run continuously until you press the PROGRAM key, unless it encounters an EOM or a page select error.

Sections (c) through (h) explain the information given on the test status line in detail.

(c) Mode. When an error is found, the logic mode in which it was found is put up in the first character position of the status line. In Figure J-7, this position is vacant because no errors have been found; in Figure J-8, the error was found in Mode 1.

(d) Pass Count. The Pass Count is a decimal number. Each time the test logic makes one pass (Mode 1 and Mode 2) through the memory, the Pass Count (P)

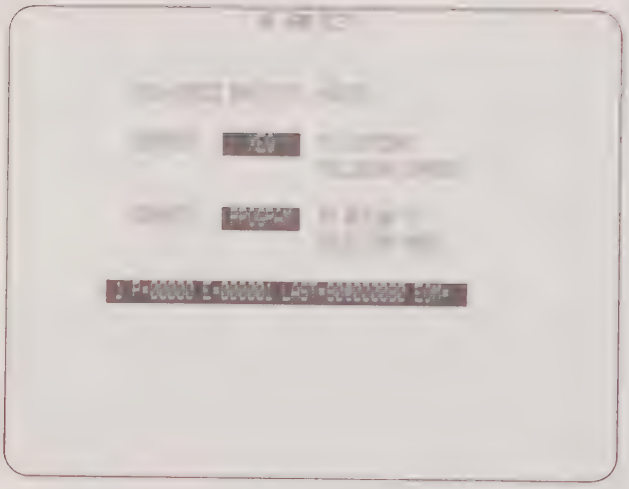


Figure J-8

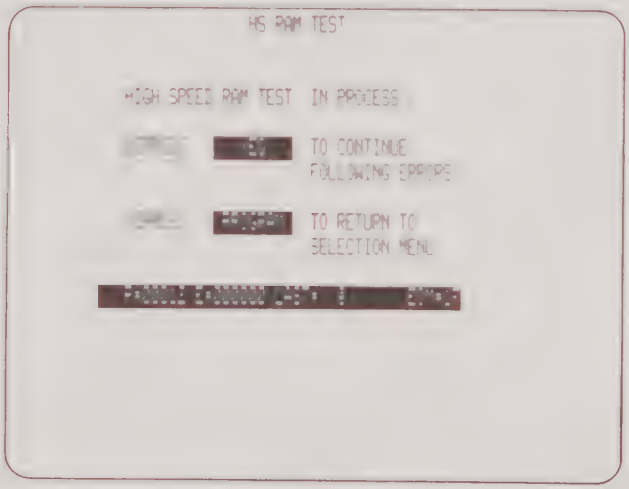


Figure J-9

increments (compare Figure J-7 with Figure J-9). Each pass takes about 12 seconds for the 1-Megabit RAM, or about 40 seconds for a 4-Megabit RAM. This count is cumulative until the test is reinitialized by powering up the COMSTATE II and pressing the PROGRAM and XEQ keys again.

(e) Error Count. The Error Count is a decimal number that increments each time an error is found until the test is initialized (Figure J-8).

(f) Address of the Last Error Found. The specific address of the last error found is given by LAST = ww @ xxyyyy.

The first two digits after LAST, ww, are the hexadecimal value of the bit mask formed by the column addresses in which errors have been found. Figure J-10 shows the column numbers of the chips on the a 1-Megabit memory board (Board G); Figure J-11 shows the addressing on a 4-Megabit memory board. Column 1 is the low-order bit; column 8, the highest-order bit in the mask. An error in a column is represented by a 1 in its position in the mask. A value for ww of 0A (hex), as shown in Figure J-12, represents the binary number 0000 1010. This indicates that errors were found in columns 2 and 4 of Board G. (The logic arrives at the error mask by taking the exclusive OR of Data Written and Data Read in either Mode 1 or Mode 2.)

The hexadecimal page address is given by the first two digits after the @ sign, xx. For the 1-Megabit RAM, this value can range from 00 through 07 (hex), which corresponds to Rows A, B, C, D, E, F, G, and H, respectively, on Board G (see Figure J-10). For the 4-Megabit RAM, the address ranges from 00 to 1F (hex) as shown in Figure J-11.

The hexadecimal bit address within the page is given by yyyy. The range for this value for either 1-Megabit or 4-Megabit RAM is 0000 to 3FFF (hex). The bit address changes each time the logic finds an error, and thus shows how many errors there are at any particular page and column location.

Using this column and row information, you can locate the specific RAM chip at fault.

(g) End of Memory Found. After each pass, the last page of memory found will be displayed in hexadecimal at the far right (EOM, or End of Memory; Figure J-9). For the 1-Megabit RAM option, the only valid EOM value is 07 (hex) (Figure J-10) because there are eight pages of memory. For the 4-Megabit RAM (which has 32 pages; see Figure J-11), EOM should be 1F (hex).

During normal operation, End of Memory is detected by logic on Board G. This logic is tested during both the write and read test cycles. If the End of Memory values detected within one pass are inconsistent the following message appears on the RAM status line:

```
WRITE PASS EOM = XX :
 READ PASS EOM = YY
```

The values XX and YY are in hexadecimal and may range from 00 to 1F (hex).

To record or play back from any block other than 000, the COMSTATE II uses Page Address Select Logic. This logic is also tested during the self tests. If a malfunction is found, the following message appears:

```
BOARD G MODE 1 PAGE ADDRESS SELECT
  ERROR
```

(h) Counter Overflow. When the Pass or Error Counter has overflowed, the equal sign (=) in the status line is replaced by a "pound" sign (#).

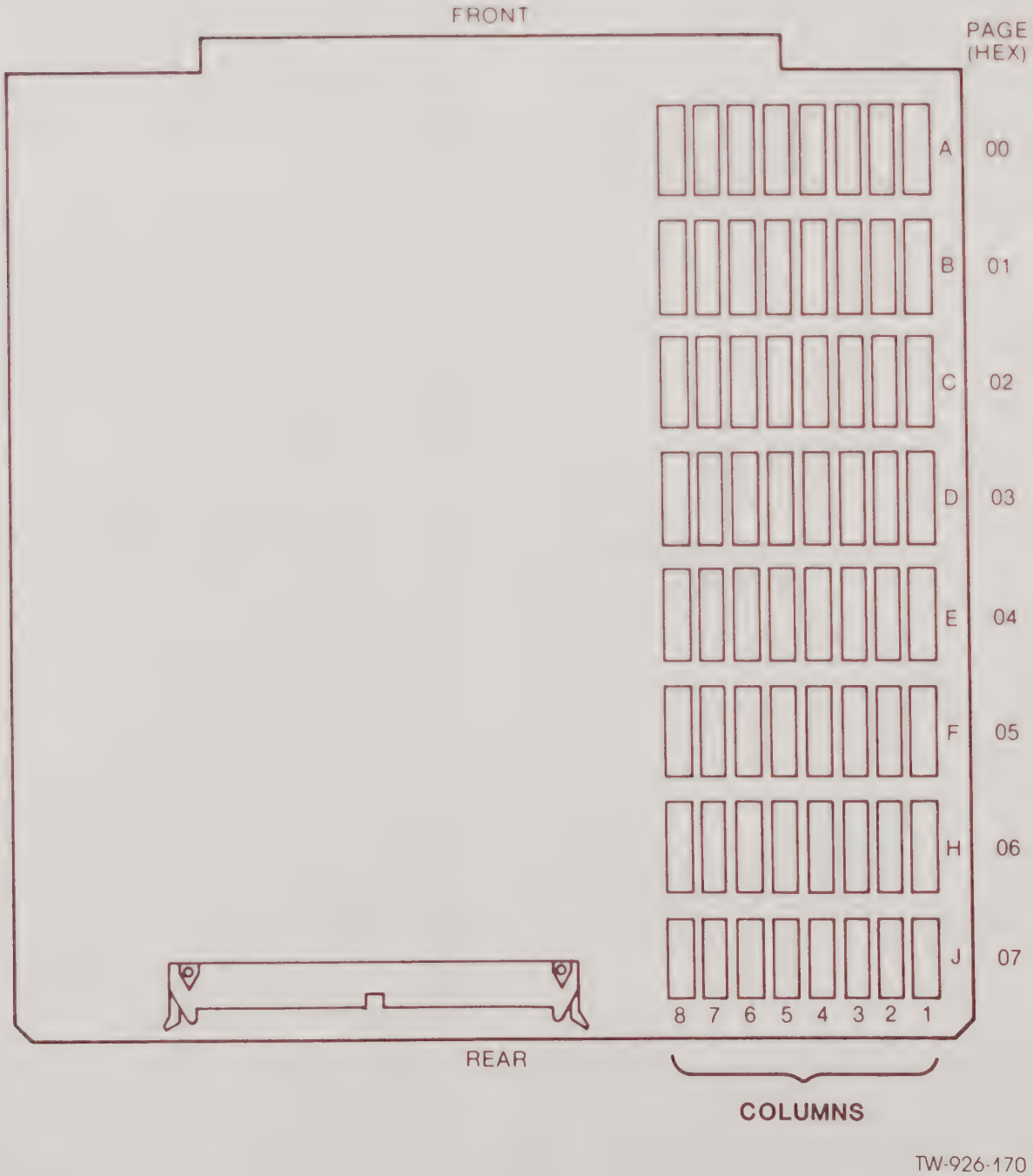


Figure J-10 Board G: 1-Megabit RAM addressing.

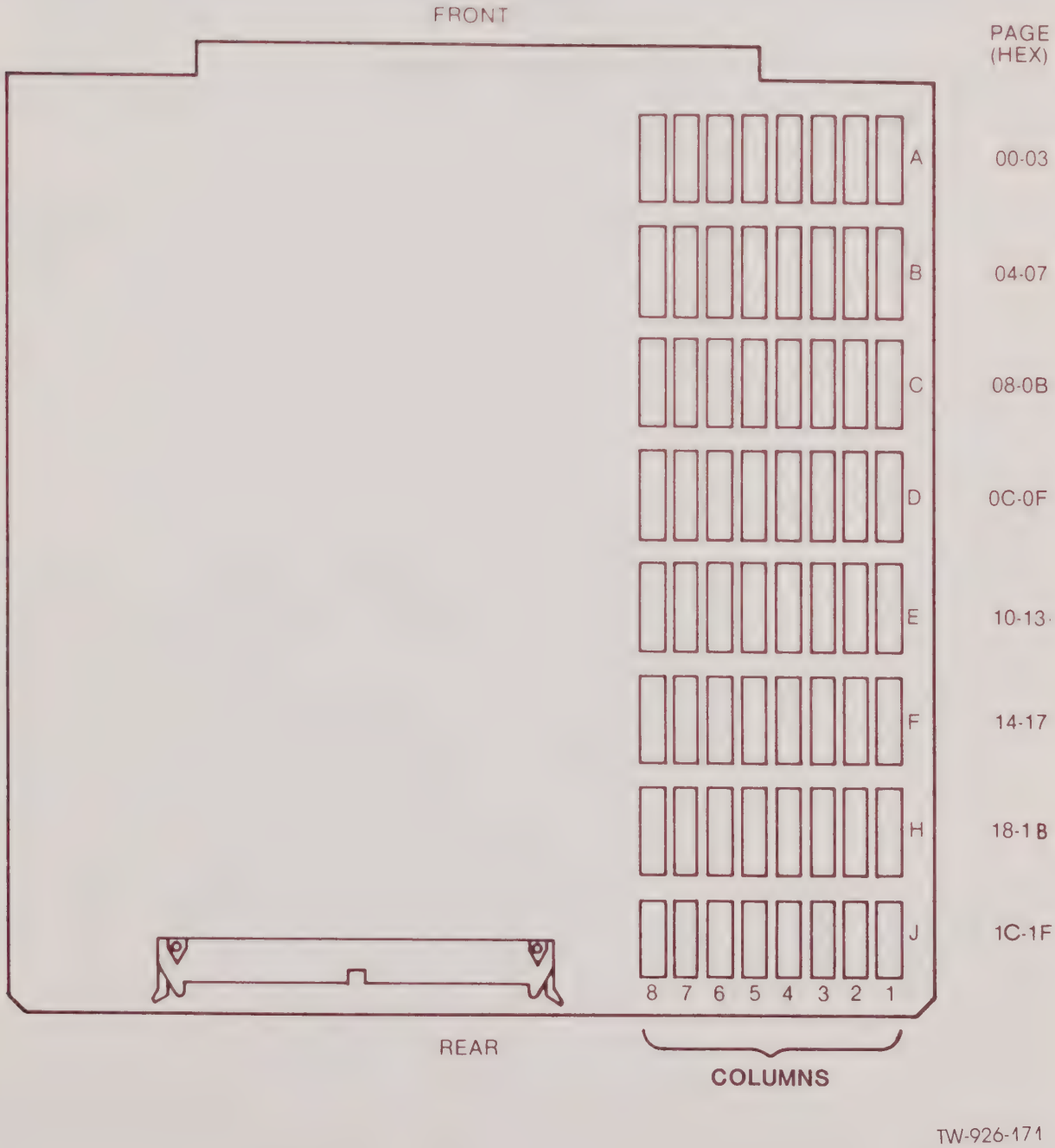


Figure J-11 Board G: 4-Megabit RAM addressing.

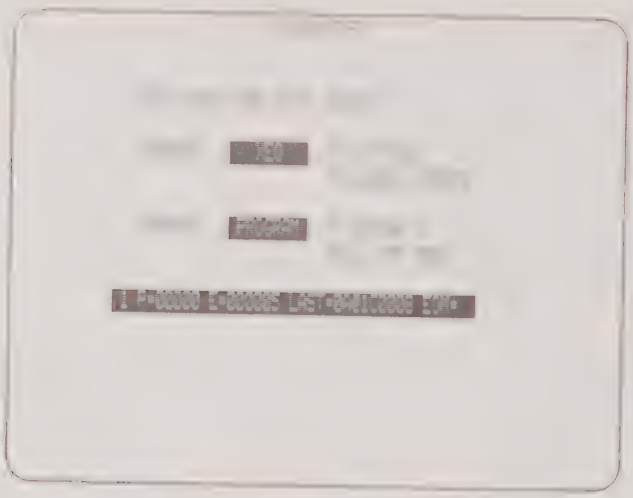


Figure J-12

J.5 REMOVING TOP (AND/OR BOTTOM) COVER

WARNING: Removal of the top or bottom cover of the COMSTATE II whether or not the power cord is connected may expose personnel to dangerous high voltages and high-vacuum CRT hazard. Under no circumstances should anyone but qualified service personnel remove either cover or attempt any kind of repair.

CAUTION: Read these instructions carefully before you attempt to remove the blue top or bottom cover of the COMSTATE II. The covers are held in place by white plastic bezels which may crack if the cover is removed incorrectly.

Refer to Figure J-13 as you read the following procedure:

(1) Always disconnect the power cord before removing either cover.

(2) The two screws securing the top cover to the chassis are located adjacent to the handle detent mechanisms on either side of the front of the unit. Remove these two screws.

CAUTION: Raising the cover more than 1/4 inch during removal or replacement may cause the bezel to deform or crack. The proper procedure requires no force.

(3) Gently slide the top cover toward the front of the instrument (about 1/4 inch of movement) until it stops.

(4) Slightly raise the rear of the top cover, just enough so the edges clear the rear bezel. Hold it in this position while you spread the sides of the cover to clear the sides of the bezel. Then slide the cover to the rear (about 1/2 inch of movement) until it frees itself from the front bezel.

(5) Lift the cover off the instrument. To replace the cover, reverse the procedure, sliding the cover into the front bezel first.

To remove the bottom cover, turn the unit upside down and follow the same procedure as for the top cover.

J.6 CRT ADJUSTMENTS

CRT adjustments should only be performed if there is good reason to believe they are required. In order to make the adjustments, the COMSTATE II must be operated with the top cover removed and the adjustments must be performed in an area that exposes service personnel to dangerous high voltages and the hazards of the high-vacuum CRT. Also, while the covers are removed there is great danger of overheating the COMSTATE II with the possibility of permanent damage. Thus, the following procedures should be performed only by thoroughly qualified personnel in strict accordance with these instructions.

J.6.1 Equipment

To make CRT adjustments, you will need a screwdriver and a clip lead.

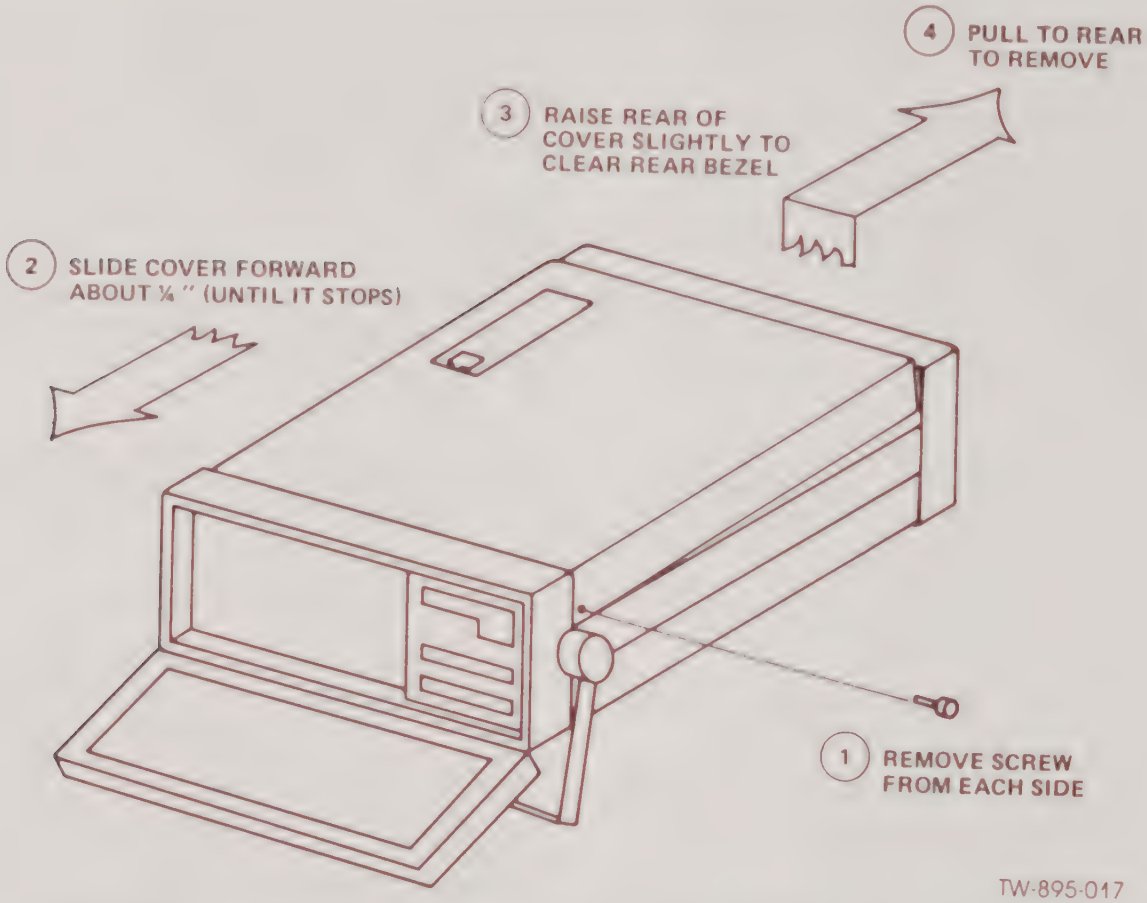

4 PULL TO REAR TO REMOVE
3 RAISE REAR OF COVER SLIGHTLY TO CLEAR REAR BEZEL
2 SLIDE COVER FORWARD ABOUT ¼ " (UNTIL IT STOPS)
1 REMOVE SCREW FROM EACH SIDE
TW-895-017

Figure J-13 Removing the top cover of the COMSTATE II. To remove the bottom cover, follow the same procedure with the unit turned upside down. To replace the cover, reverse the procedure, sliding the cover into the front bezel first.

WARNING: Removal of either cover of the COMSTATE II with or without the power cord connected exposes personnel to dangerous high voltages and high vacuum CRT hazard. Under no circumstances should anyone but qualified service personnel remove the top cover or attempt any kind of repair.

J.6.2 Warmup

CRT adjustments can be done more precisely if the COMSTATE II is first allowed to warm up for 5 to 10 minutes with the cover in place. A longer warmup period should be allowed if the unit has been stored or transported at temperatures substantially below or above normal operating temperature.

Remove the top cover in accordance with the instructions in Section J.5.

CAUTION: Operation of the COMSTATE II with the top cover removed exposes the unit to the possibility of damage due to overheating. Keep operating time to a minumum while the cover is off.

J.6.3 Background Brightness Adjustment

(1) With the top cover removed, power up the COMSTATE II.

(2) Using the brightness control on the rear panel (see Figure J-14), adjust the CRT brightness to a minimum so that no data is visible.

(3) With a screwdriver, adjust BRIGHTNESS on the CRT Electronics Board (see Figures J-15 and J-16) clockwise until you see the CRT raster pattern.

(4) Back down the adjustment (counterclockwise) until the raster just disappears. Then readjust the rear panel brightness control as explained in Appendix I.

J.6.4 Vertical Hold

After the frequency setting (Switch S1-8) has been changed from 60 to 50 Hz or vice versa, the CRT display may roll. To correct this, do the following:

(1) Set the switch S1-8 on Board A (Line Interface Module) to the power line frequency desired.

(2) Operate the blue PROGRAM key.

(3) With a screwdriver, turn the Vertical Hold adjustment on the upper, rear corner of the CRT Electronics Board (see Figure J-16) until the display stops rolling.

If no further adjustments are to be made, disconnect the power immediately and replace the cover.

J.6.5 Other Adjustments

A qualified electronics technician may make other standard adjustments to the CRT, such as display rotation, centering, height, width, or linearity. If the need arises, contact Atlantic Research Corporation for further information.

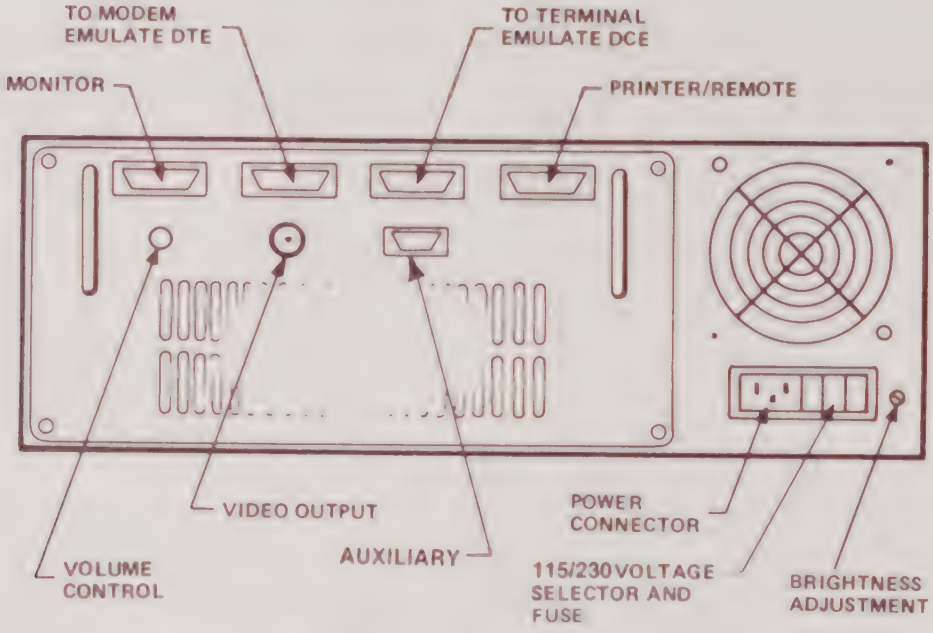


Figure J-14 Rear panel of the COMSTATE II. TW-926-002

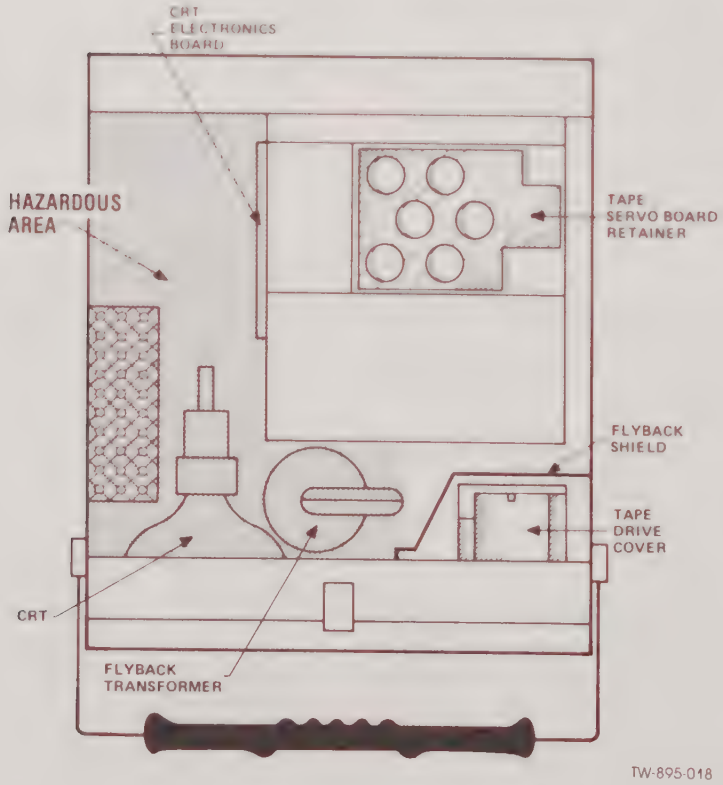


Figure J-15 COMSTATE II with top cover removed. Tape Servo Board is under the Tape Servo Board Retainer.

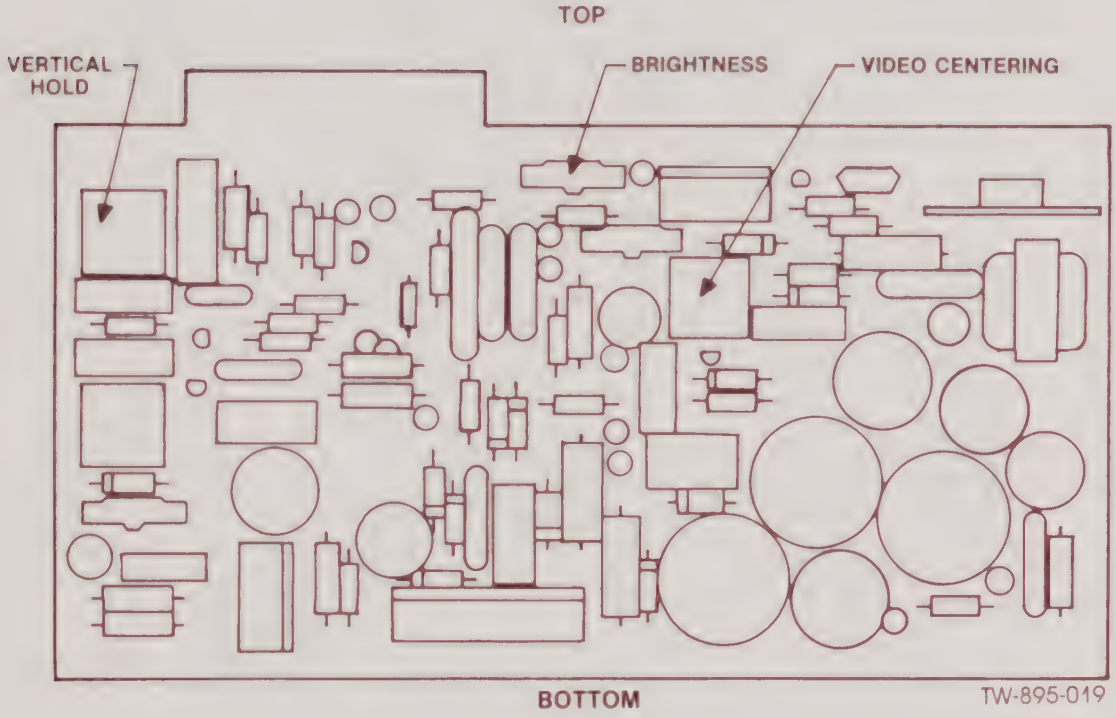


Figure J-16 Diagram of CRT Electronics Board. For location of this board in the unit, see Figure J-15.

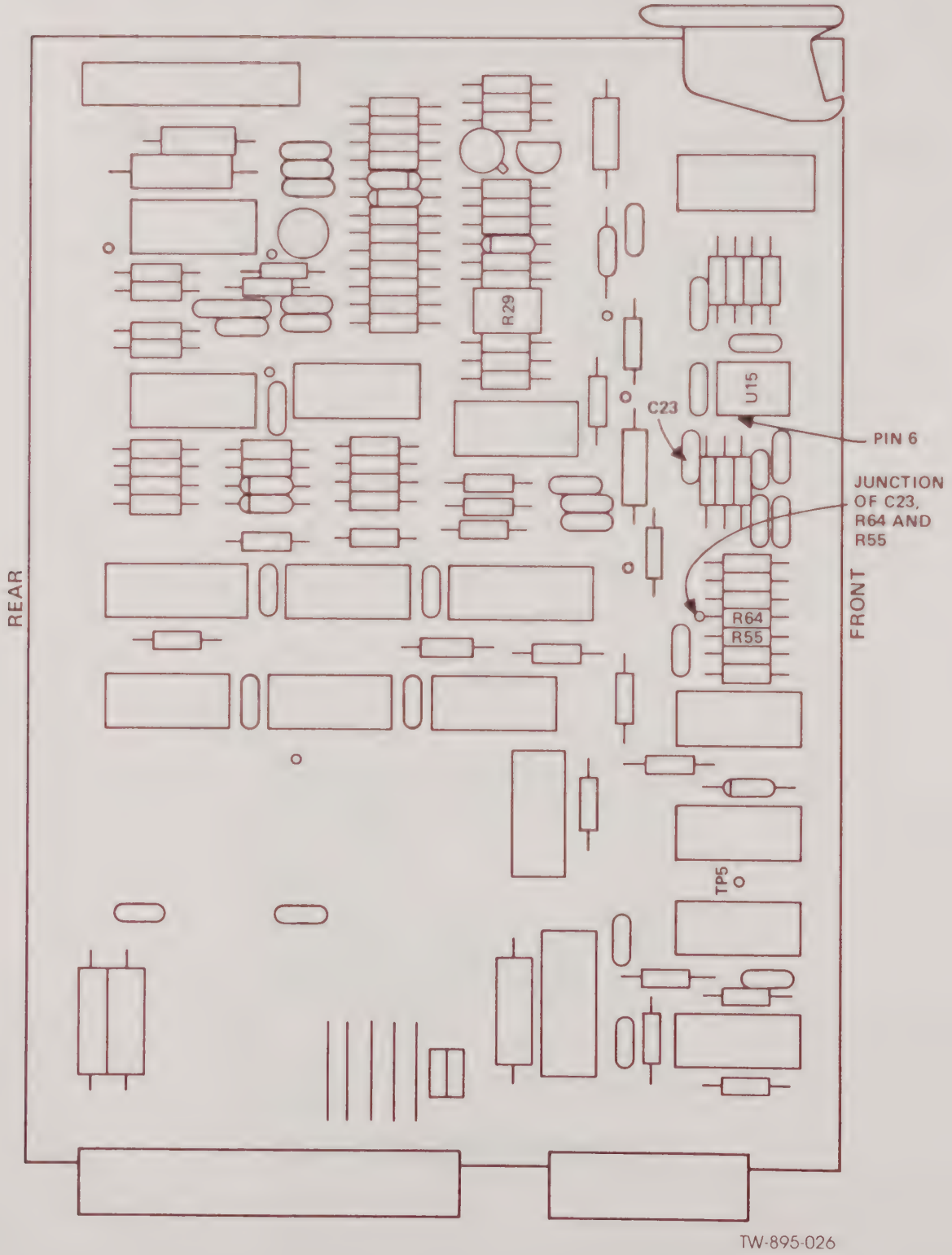


Figure J-17a Diagram of Tape Servo Board.

J.7 CALIBRATION OF THE TAPE DRIVE

Calibrations should be performed only if there is good reason to believe that they are required. In order to make the adjustments, the COMSTATE II must be operated with the top and bottom covers removed. This exposes service personnel to dangerous high voltages and the hazards of the high vacuum CRT. While the covers are removed, there is also great danger of overheating with the possibility of permanent damage. Thus, the following procedures should be performed only by thoroughly qualified personnel in strict accordance with these instructions.

J.7.1 Equipment

You will need a frequency counter, an oscilloscope, a new blank tape cartridge, and a tape cartridge with recorded data (training tape).

J.7.2 Removing the Covers

Remove the top and bottom covers in accordance with the procedure in Section J.5.

CAUTION: Operation of the COMSTATE II with the top and (or) bottom covers removed exposes the unit to the possibility of damage due to overheating. Keep operating time to a minimum while the covers are off.

J.7.3 Tape Speed Adjustment

(1) Remove the tape servo board retainer (see Figure J-15).

(2) Insert a new blank tape in the drive.

(3) Connect the frequency counter common ground to the chassis.

(4) Connect the frequency counter input to TP 5 on the tape servo board (see Figures J-17a and J-17b).

NOTE: The tape servo board in your unit may be similar to either Figure J-17a or J-17b.

(5) Power up the unit. Press PROGRAM; then PARAM and (numeral) 1.

(6) Select TAPE on the SOURCE line; then use the ENTER key to get to the data-entry field below the SPEED line and enter (numerals) 9600. The menu should look like Figure J-18.

(7) Press the RUN key once. The tape should rewind and then run continuously forward. If the tape starts and stops, it has been recorded and cannot be used for this purpose. A blank tape must be used to set tape speed.

(8) The frequency counter should indicate 7900 +/-150 Hz. This measurement must be made while the tape is moving continuously forward. If the tape reaches the end and stops before the reading is obtained, operate the PROGRAM key and the RUN key to rewind and restart the tape.

NOTE: The tape should not be adjusted while rewinding.

(9) If necessary, use a screwdriver to adjust R29 on the tape servo board (Figure J-17a or J-17b) to obtain a reading of 7900 +/-150 Hz. The frequency will vary somewhat over the length of the tape, but should remain within the +/-150 Hz tolerance. The tape speed is set at the factory to be as close as possible to 7900 Hz in the middle of the tape after the counter reading has stabilized.

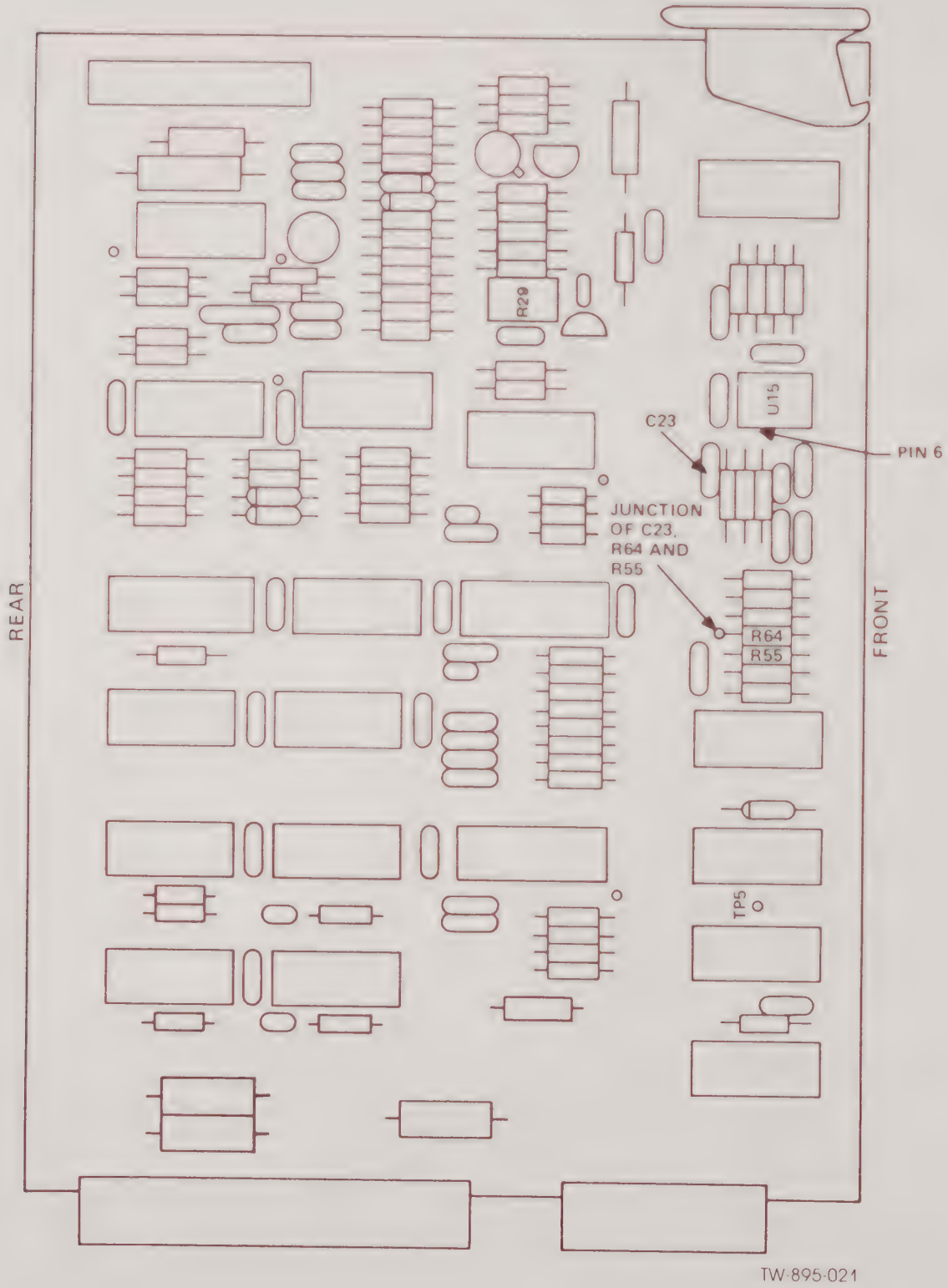


Figure J-17b Diagram of alternate Tape Servo Board.

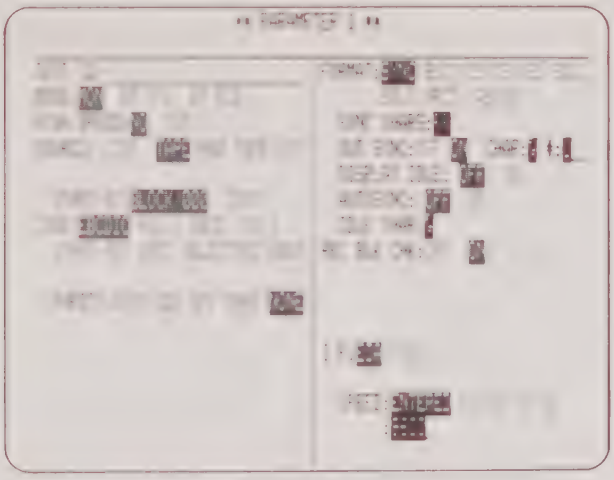


Figure J-18

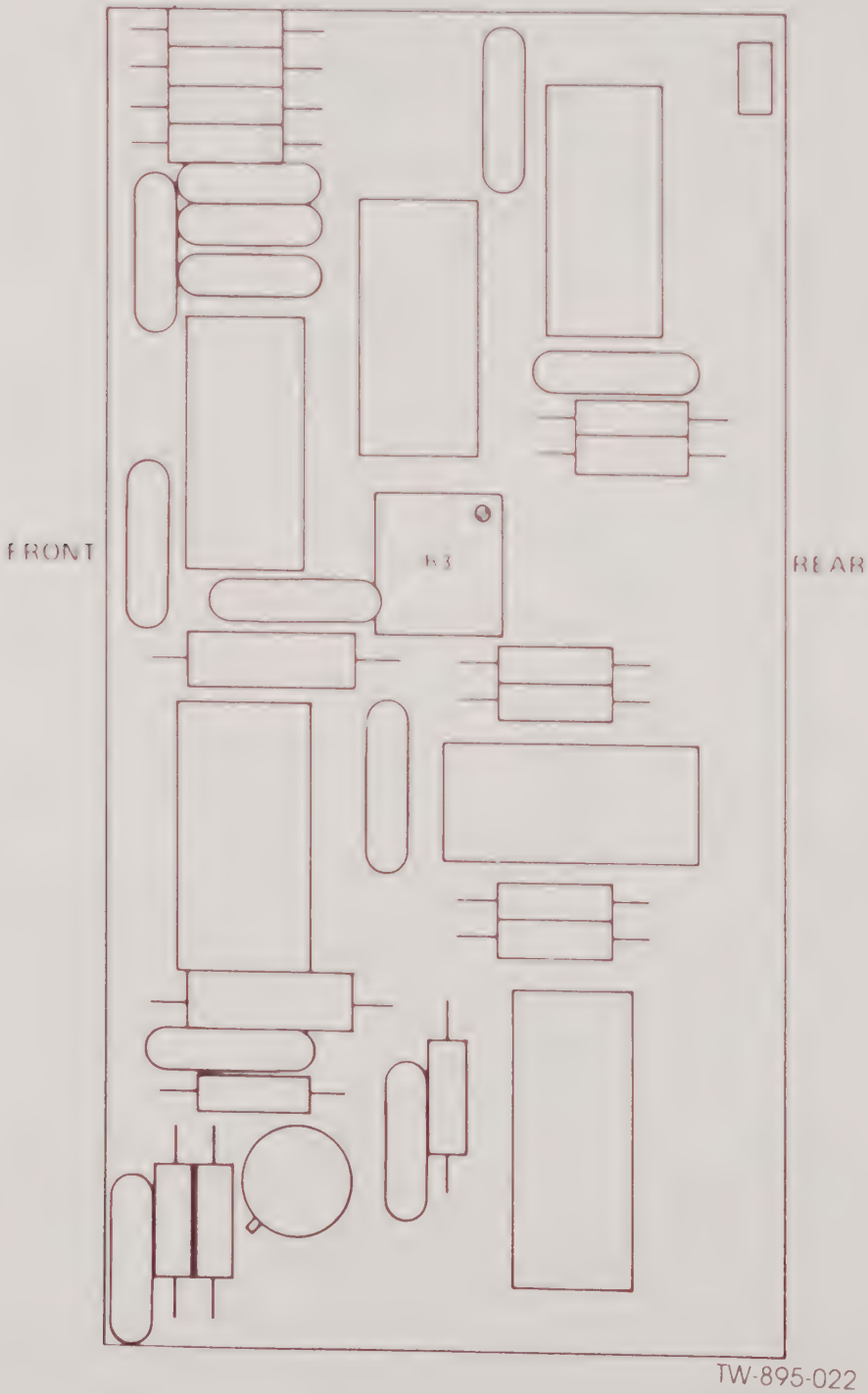


Figure J-19 Diagram of Read-Write Board viewed through chassis from underside of unit.

(10) After adjustment, press PROGRAM and RUN again to rewind the tape and recheck the reading over the length of the tape.

(11) Press PROGRAM and then power down the unit immediately to prevent overheating.

J.7.4 Read Gain Adjustment

(1) Remove the top and bottom covers (as described in Section J.5) and the tape servo board retainer (Figure J-15).

(2) Clean the tape head before performing this adjustment (refer to Appendix I).

(3) Connect the oscilloscope common ground to the chassis. Connect the oscilloscope input to the junction of R64, R55, and C23 on the tape servo board (see Figure J-17a or J-17b).

(4) Power up the unit. Press PROGRAM; then PARAM and (numeral) 1.

(5) Select TAPE on the SOURCE line; then use the ENTER key to get to the data-entry field below the SPEED line and enter (numerals) 9600. The menu should look like Figure J-18.

(6) Select a tape that is fully recorded with data (training tape). Make the proper code and format selections for the taped data on the Parameter 1 menu. Do not load the training tape program.

(7) Insert the tape in the drive and press the RUN key. While data is being read from the tape, the waveform at the junction of R64, R55, and C23 should be 7.5 +/-0.5 V peak-to-peak.

(8) If necessary, use a screwdriver to adjust R3 on the Read-Write Board (see Figure J-19) to obtain the correct voltage. The Read-Write Board is located on the bottom of the tape drive and is accessible through the chassis from the bottom of the unit.

(9) Press PROGRAM and then power down the COMSTATE II immediately.

J.7.5 Tape Hole Sensor Adjustment

NOTE: There are two types of tapes, classified by the size of the Tape Mark Sensor (TMS) hole: large hole (0.045-in. diameter) and small hole (0.023-in. diameter).

(1) Clean the tape hole sensor before performing this adjustment (refer to Appendix I).

(2) Power up the unit.

(3) Install a tape with a small TMS hole (0.023-in. diameter).

(4) Press the PROGRAM, then the LOAD PROG key to position the tape so you can locate the TMS hole on the tape.

(5) Power down the COMSTATE II.

(6) Remove the tape. Looking at the cartridge from the rear, lift the tape head door and locate the TMS hole in the tape by pushing the roller toward the door. Position the hole directly over the mirror.

(7) Repeat steps (3) through (6) with the large TMS hole (0.045-in. diameter) tape.

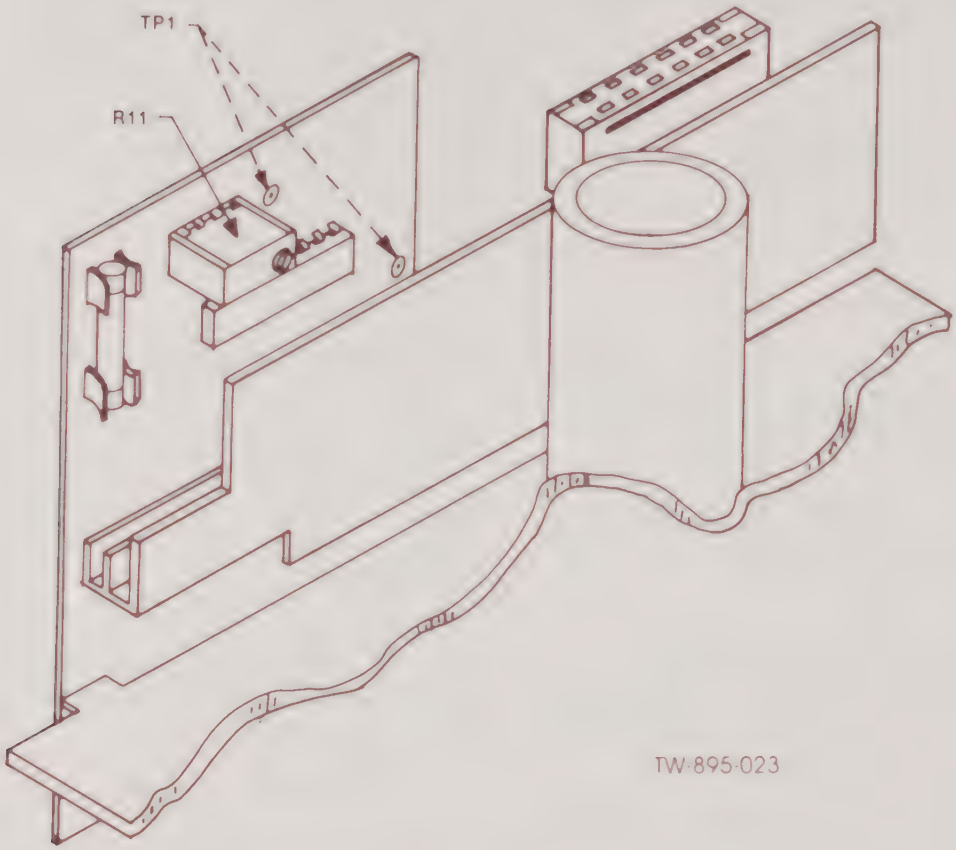


Figure J-20 Tape Status-Drive Board viewed from the underside of the chassis.

(8) Do not install either tape now.

(9) Remove the top and bottom covers as explained in Section J.5.

(10) Connect the oscilloscope common ground to the chassis. Connect the oscilloscope input to TP 1 on the tape status-drive board. See Figure J-20. TP 1 is accessible through cutouts in the bottom and side of the COMSTATE chassis. This test point may be in either of two locations (see Figures J-21a and J-21b).

(11) Power up the unit. After the internal self tests are finished, reinstall the small-hole tape in the drive.

(12) Monitor TP 1 on the oscilloscope while you rotate the tape capstan with a screwdriver until a maximum peak-to-peak waveform is obtained.

CAUTION: Do not touch the tachometer disc.

(13) Adjust R11 on the status drive board for 1.5 V peak-to-peak (see Figure J-20).

(14) Remove the small-hole tape. Move the tape by hand until the hole is no longer over the mirror. If the hole is left over the mirror, the COMSTATE II will not detect the presence of the tape.

(15) Install the large-hole tape. Rotate the tape capstan until a maximum peak-to-peak waveform is obtained at TP-1. The dc offset voltage should not exceed 6 V to the center of the waveform. If the center of the waveform does exceed 6 V, adjust R11 for 6 V at TP 1.

(16) Power down the COMSTATE II immediately to prevent overheating.

(17) Remove the tape. Move the tape by hand until the hole is no longer over the mirror. If the hole is left over the mirror, the COMSTATE II will not detect the presence of the tape.

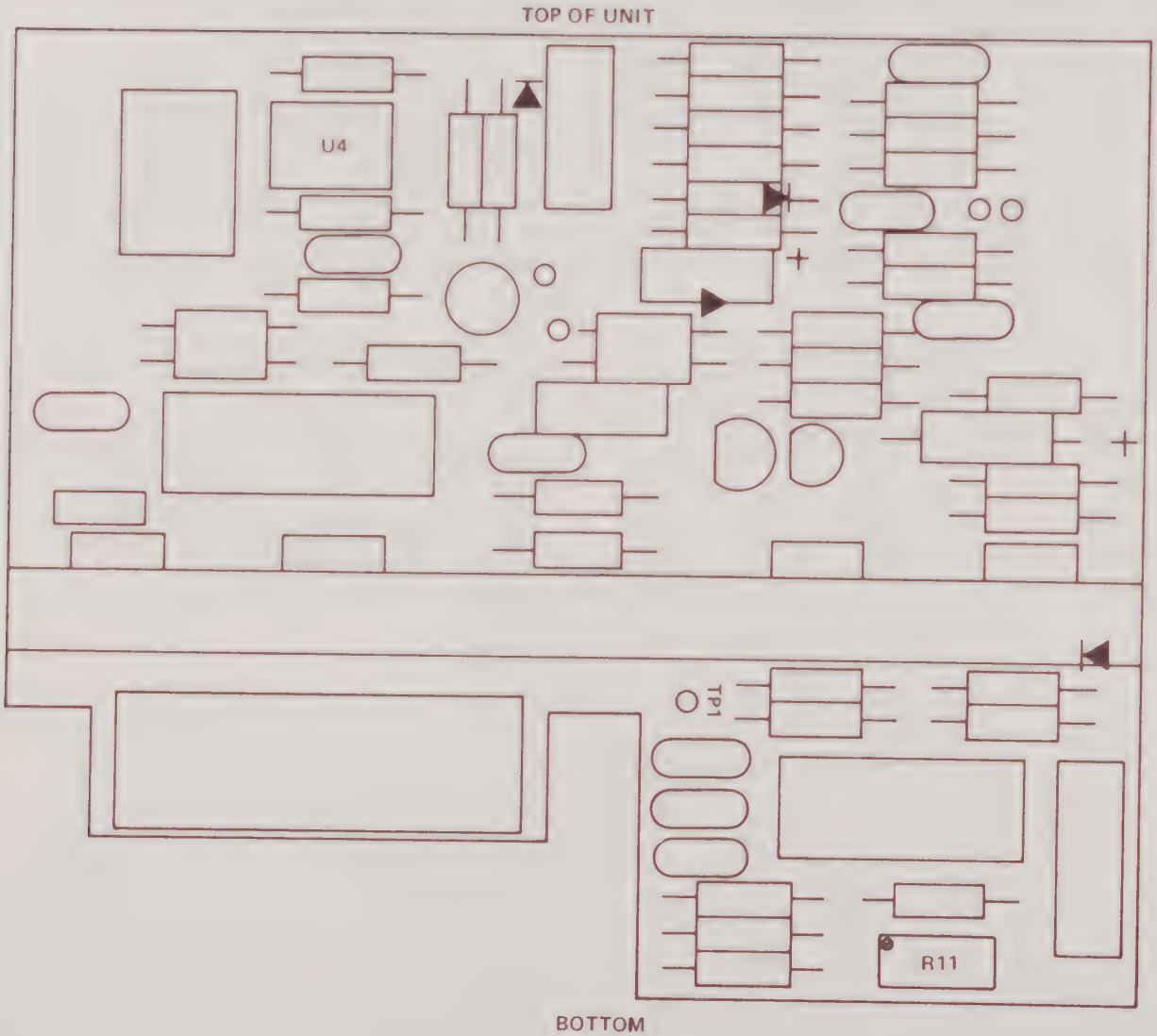


Figure J-21a Diagram of Tape Status-Drive Board.

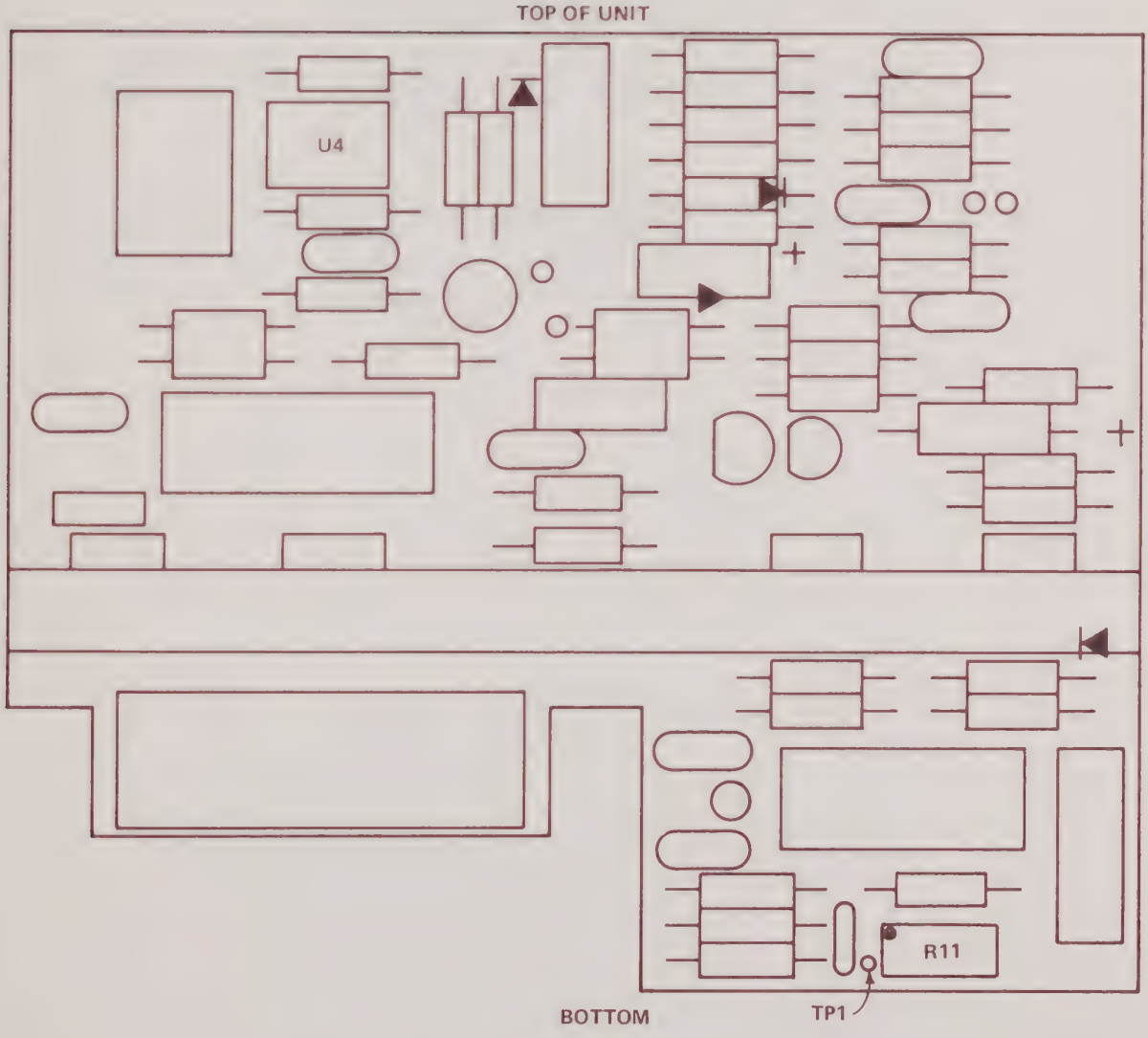


Figure J-21b Diagram of alternate Tape Status-Drive Board.

APPENDIX K
SELECTABLE DATA SPEEDS

The numbers listed in this appendix represent the data speeds (of 47.96 bps and higher) that can be selected precisely on the parameter menus. Speeds are in bits per second. If other speeds are entered, they will be approximated only.

28800.00	929.03	472.13	316.48	238.02	190.73	159.12	136.49	119.50	106.27
19200.00	914.29	468.29	314.75	237.04	190.10	158.68	136.17	119.25	106.08
14400.00	900.00	464.52	313.04	236.07	189.47	158.24	135.85	119.01	105.88
11520.00	886.15	460.80	311.35	235.10	188.85	157.81	135.53	118.76	105.69
9600.00	872.73	457.14	309.68	234.15	188.24	157.38	135.21	118.52	105.49
8228.57	859.70	453.54	308.02	233.20	187.62	156.95	134.89	118.28	105.30
7200.00	847.06	450.00	306.38	232.26	187.01	156.52	134.58	118.03	105.11
6400.00	834.78	446.51	304.76	231.33	186.41	156.10	134.27	117.79	104.92
5760.00	822.86	443.08	303.16	230.40	185.81	155.68	133.95	117.55	104.73
5236.36	811.27	439.69	301.57	229.48	185.21	155.26	133.64	117.31	104.54
4800.00	800.00	436.36	300.00	228.57	184.62	154.84	133.33	117.07	104.35
4430.77	789.04	433.08	298.45	227.67	184.03	154.42	133.03	116.84	104.16
4114.29	778.38	429.85	296.91	226.77	183.44	154.01	132.72	116.60	103.97
3840.00	768.00	426.67	295.38	225.88	182.86	153.60	132.41	116.36	103.78
3600.00	757.89	423.53	293.88	225.00	182.28	153.19	132.11	116.13	103.60
3388.24	748.05	420.44	292.39	224.12	181.70	152.79	131.81	115.90	103.41
3200.00	738.46	417.39	290.91	223.26	181.13	152.38	131.51	115.66	103.23
3031.58	729.11	414.39	289.45	222.39	180.56	151.98	131.21	115.43	103.04
2880.00	720.00	411.43	288.00	221.54	180.00	151.58	130.91	115.20	102.86
2742.86	711.11	408.51	286.57	220.69	179.44	151.18	130.61	114.97	102.67
2618.18	702.44	405.63	285.15	219.85	178.88	150.79	130.32	114.74	102.49
2504.35	693.98	402.80	283.74	219.01	178.33	150.39	130.02	114.51	102.31
2400.00	685.71	400.00	282.35	218.18	177.78	150.00	129.73	114.29	102.13
2304.00	677.65	397.24	280.98	217.36	177.23	149.61	129.44	114.06	101.95
2215.38	669.77	394.52	279.61	216.54	176.69	149.22	129.15	113.83	101.77
2133.33	662.07	391.84	278.26	215.73	176.15	148.84	128.86	113.61	101.59
2057.14	654.55	389.19	276.92	214.93	175.61	148.45	128.57	113.39	101.41
1986.21	647.19	386.58	275.60	214.13	175.08	148.07	128.29	113.16	101.23
1920.00	640.00	384.00	274.29	213.33	174.55	147.69	128.00	112.94	101.05
1858.06	632.97	381.46	272.99	212.55	174.02	147.31	127.72	112.72	100.88
1800.00	626.09	378.95	271.70	211.76	173.49	146.94	127.43	112.50	100.70
1745.45	619.35	376.47	270.42	210.99	172.97	146.56	127.15	112.28	100.52
1694.12	612.77	374.03	269.16	210.22	172.46	146.19	126.87	112.06	100.35
1645.71	606.32	371.61	267.91	209.45	171.94	145.82	126.59	111.84	100.17
1600.00	600.00	369.23	266.67	208.70	171.43	145.45	126.32	111.63	100.00
1556.76	593.81	366.88	265.44	207.94	170.92	145.09	126.04	111.41	99.83
1515.79	587.76	364.56	264.22	207.19	170.41	144.72	125.76	111.20	99.65
1476.92	581.82	362.26	263.01	206.45	169.91	144.36	125.49	110.98	99.48
1440.00	576.00	360.00	261.82	205.71	169.41	144.00	125.22	110.77	99.31
1404.88	570.30	357.76	260.63	204.98	168.91	143.64	124.95	110.56	99.14
1371.43	564.71	355.56	259.46	204.26	168.42	143.28	124.68	110.34	98.97
1339.53	559.22	353.37	258.30	203.53	167.93	142.93	124.41	110.13	98.80
1309.09	553.85	351.22	257.14	202.82	167.44	142.57	124.14	109.92	98.63
1280.00	548.57	349.09	256.00	202.11	166.96	142.22	123.87	109.71	98.46
1252.17	543.40	346.99	254.87	201.40	166.47	141.87	123.61	109.51	98.29
1225.53	538.32	344.91	253.74	200.70	165.99	141.52	123.34	109.30	98.13
1200.00	533.33	342.86	252.63	200.00	165.52	141.18	123.08	109.09	97.96
1175.51	528.44	340.83	251.53	199.31	165.04	140.83	122.81	108.88	97.79
1152.00	523.64	338.82	250.43	198.62	164.57	140.49	122.55	108.68	97.63
1129.41	518.92	336.84	249.35	197.94	164.10	140.15	122.29	108.47	97.46
1107.69	514.29	334.88	248.28	197.26	163.64	139.81	122.03	108.27	97.30
1086.79	509.73	332.95	247.21	196.59	163.17	139.47	121.78	108.07	97.13
1066.67	505.26	331.03	246.15	195.92	162.71	139.13	121.52	107.87	96.97
1047.27	500.87	329.14	245.11	195.25	162.25	138.80	121.26	107.66	96.81
1028.57	496.55	327.27	244.07	194.59	161.80	138.46	121.01	107.46	96.64
1010.53	492.31	325.42	243.04	193.94	161.34	138.13	120.75	107.26	96.48
993.10	488.14	323.60	242.02	193.29	160.89	137.80	120.50	107.06	96.32
976.27	484.03	321.79	241.00	192.64	160.45	137.47	120.25	106.86	96.16
960.00	480.00	320.00	240.00	192.00	160.00	137.14	120.00	106.67	96.00
944.26	476.03	318.23	239.00	191.36	159.56	136.82	119.75	106.47	95.84

95.68	87.01	79.78	73.66	68.41	63.86	59.88	56.36	53.23	50.44
95.52	86.88	79.67	73.56	68.33	63.79	59.81	56.30	53.19	50.39
95.36	86.75	79.56	73.47	68.25	63.72	59.75	56.25	53.14	50.35
95.21	86.62	79.45	73.38	68.17	63.65	59.69	56.20	53.09	50.31
95.05	86.49	79.34	73.28	68.09	63.58	59.63	56.14	53.04	50.26
94.89	86.36	79.23	73.19	68.00	63.51	59.57	56.09	52.99	50.22
94.74	86.23	79.12	73.10	67.92	63.44	59.50	56.03	52.94	50.17
94.58	86.10	79.01	73.00	67.84	63.37	59.44	55.98	52.89	50.13
94.43	85.97	78.90	72.91	67.76	63.30	59.38	55.92	52.84	50.09
94.27	85.84	78.80	72.82	67.69	63.23	59.32	55.87	52.80	50.04
94.12	85.71	78.69	72.73	67.61	63.16	59.26	55.81	52.75	50.00
93.96	85.59	78.58	72.64	67.53	63.09	59.20	55.76	52.70	49.96
93.81	85.46	78.47	72.54	67.45	63.02	59.14	55.71	52.65	49.91
93.66	85.33	78.37	72.45	67.37	62.95	59.08	55.65	52.60	49.87
93.51	85.21	78.26	72.36	67.29	62.88	59.02	55.60	52.55	49.83
93.35	85.08	78.15	72.27	67.21	62.81	58.96	55.54	52.51	49.78
93.20	84.96	78.05	72.18	67.13	62.75	58.90	55.49	52.46	49.74
93.05	84.83	77.94	72.09	67.05	62.68	58.84	55.44	52.41	49.70
92.90	84.71	77.84	72.00	66.98	62.61	58.78	55.38	52.36	49.66
92.75	84.58	77.73	71.91	66.90	62.54	58.72	55.33	52.32	49.61
92.60	84.46	77.63	71.82	66.82	62.47	58.66	55.28	52.27	49.57
92.46	84.33	77.52	71.73	66.74	62.41	58.60	55.23	52.22	49.53
92.31	84.21	77.42	71.64	66.67	62.34	58.54	55.17	52.17	49.48
92.16	84.09	77.32	71.55	66.59	62.27	58.48	55.12	52.13	49.44
92.01	83.97	77.21	71.46	66.51	62.20	58.42	55.07	52.08	49.40
91.87	83.84	77.11	71.38	66.44	62.14	58.36	55.01	52.03	49.36
91.72	83.72	77.01	71.29	66.36	62.07	58.30	54.96	51.99	49.32
91.57	83.60	76.90	71.20	66.28	62.00	58.24	54.91	51.94	49.27
91.43	83.48	76.80	71.11	66.21	61.94	58.18	54.86	51.89	49.23
91.28	83.36	76.70	71.02	66.13	61.87	58.12	54.80	51.85	49.19
91.14	83.24	76.60	70.94	66.06	61.80	58.06	54.75	51.80	49.15
91.00	83.12	76.49	70.85	65.98	61.74	58.01	54.70	51.75	49.10
90.85	83.00	76.39	70.76	65.90	61.67	57.95	54.65	51.71	49.06
90.71	82.88	76.29	70.67	65.83	61.60	57.89	54.60	51.66	49.02
90.57	82.76	76.19	70.59	65.75	61.54	57.83	54.55	51.61	48.98
90.42	82.64	76.09	70.50	65.68	61.47	57.77	54.49	51.57	48.94
90.28	82.52	75.99	70.42	65.60	61.41	57.72	54.44	51.52	48.90
90.14	82.40	75.89	70.33	65.53	61.34	57.66	54.39	51.47	48.85
90.00	82.29	75.79	70.24	65.45	61.28	57.60	54.34	51.43	48.81
89.86	82.17	75.69	70.16	65.38	61.21	57.54	54.29	51.38	48.77
89.72	82.05	75.59	70.07	65.31	61.15	57.49	54.24	51.34	48.73
89.58	81.93	75.49	69.99	65.23	61.08	57.43	54.19	51.29	48.69
89.44	81.82	75.39	69.90	65.16	61.02	57.37	54.14	51.25	48.65
89.30	81.70	75.29	69.82	65.08	60.95	57.31	54.08	51.20	48.61
89.16	81.59	75.20	69.73	65.01	60.89	57.26	54.03	51.15	48.57
89.03	81.47	75.10	69.65	64.94	60.82	57.20	53.98	51.11	48.53
88.89	81.36	75.00	69.57	64.86	60.76	57.14	53.93	51.06	48.48
88.75	81.24	74.90	69.48	64.79	60.70	57.09	53.88	51.02	48.44
88.62	81.13	74.81	69.40	64.72	60.63	57.03	53.83	50.97	48.40
88.48	81.01	74.71	69.31	64.65	60.57	56.97	53.78	50.93	48.36
88.34	80.90	74.61	69.23	64.57	60.50	56.92	53.73	50.88	48.32
88.21	80.79	74.51	69.15	64.50	60.44	56.86	53.68	50.84	48.28
88.07	80.67	74.42	69.06	64.43	60.38	56.80	53.63	50.79	48.24
87.94	80.56	74.32	68.98	64.36	60.31	56.75	53.58	50.75	48.20
87.80	80.45	74.23	68.90	64.29	60.25	56.69	53.53	50.70	48.16
87.67	80.33	74.13	68.82	64.21	60.19	56.64	53.48	50.66	48.12
87.54	80.22	74.04	68.74	64.14	60.13	56.58	53.43	50.62	48.08
87.41	80.11	73.94	68.65	64.07	60.06	56.53	53.38	50.57	48.04
87.27	80.00	73.85	68.57	64.00	60.00	56.47	53.33	50.53	48.00
87.14	79.89	73.75	68.49	63.93	59.94	56.42	53.28	50.48	47.96

APPENDIX L
GLOSSARY OF SNA TERMS

A	Address (SDLC)
ACT	Activate
ACTLU	Activate Logical Unit
ACTPU	Activate Physical Unit
BB	Begin Bracket
BBI	Begin Bracket Indicator
BC	Begin Chain
BCI	Begin Chain Indicator
BCN	Beacon (SDLC)
BF	Boundary Function
BIU	Basic Information Unit
BLU	Basic Link Unit
BTU	Basic Transmission Unit
(c)	Configuration services
CDI	Change Direction Indicator
CDRM	Cross-Domain Resource Manager
CFGR	Configure (SDLC)
CNM	Communication Network Management
CONT	Contention
COS	Class Of Service
CPMGR	Connection Point Manager
CSC	Common Session Control
CSI	Code Selection Indicator
CSP	Control Sequence Prefix
DAF	Destination Address Field
DCE	Data Circuit-Terminating Equipment
DCF	Data Count Field
DEF	Destination Element Address Field
DES	Date Encryption Standard
DFC	Data Flow Control
DISC	Disconnect
DLC	Data Link Control
DLU	Destination Logic Unit
DM	Disconnect Mode (SDLC)
DPN	Destination Program Name
DR1I	Definite Response 1 Indicator
DR2I	Definite Response 2 Indicator
DSAF	Destination Subarea Address Field
DTE	Data Terminal Equipment
EB	End Bracket
EBCDIC	Extended Binary Coded Decimal Interchange Code
EBI	End Bracket Indicator
EC	End Chain
ECI	End Chain Indicator
ED	Enciphered Data
EDI	Enciphered Data Indicator
EFI	Expedited Flow Indicator

ENP	Enable Presentation
ER	Explicit Route
ERI	Exception Response Indicator
ERN	Explicit Route Number
ERP	Error Recovery Procedures
EVSI	ER and VR Support Indicator
Exp	Expedited flow
EXR	Exception Request
FCS	Frame Check Sequence (SDLC)
FDX	Full duplex data flow
FI	Format Indicator
FID	Format Identification
FIFO	First In First Out
FM	Function Management
FMD	Function Management Data
FMDS	Function Management Data Services
FMH	Function Management Header
FRMR	Frame Reject (SDLC)
HDX	Half-duplex data flow
HSID	Half-session Identification
IERN	Initial Explicit Route Number
ILU	Initiating Logical Unit
INIT	initiate
INP	Inhibit Presentation
IPL	Initial Program Load
LCID	Local coded graphic character set identifier
LH	Link Header
LIFO	Last In First Out
LPDA	Link Problem Determination Application
LT	Link Trailer
LSID	Local Session Identification
LU	Logical Unit
(ma)	maintenance services
(me)	measurement services
MGR	Manager
(mn)	management services
MPF	Mapping Field (BIU segments)
NA	Network Address
NAU	Network Addressable Unit
NC	Network Control
(no)	Network operator services
NP	Network Priority
NPDA	Network Problem Determination Application
NR	Number (next) receive frame (SDLC frame sequencing)
NS	Number Sent (SDLC frame sequencing)
NS	Network services

NTWK	Network
OAF	Origin Address Field
OEF	Origin Element Field
OLU	Originating Logical Unit
OSAF	Origin Subarea Field
P	Primary
PC	Path Control
PCID	Procedure Correlation Identifier
PD	Padded Data
PDI	Padded Data Indicator
P/F	Poll/Final bit (SDLC)
PI	Pacing Indicator
PIU	Path Information Unit
PLU	Primary Logical Unit
POC	Program Operator Communication
PPU	Primary Physical Unit
PRI	Primary
PRID	Procedure Related Identifier
PRN	Primary Resource Name
PS	Presentation Services
PU	Physical Unit
PUCP	Physical Unit Control Point
QR	Queued Response
QRI	Queued Response Indicator
RD	Request Disconnect (SDLC)
REJ	Reject (SDLC)
RH	Request/Response Header
RIM	Request Initialization Mode (SDLC)
RNR	Receive Not-Ready (SDLC)
RQ	Request
RR	Receive Ready (SDLC)
RRI	Request/Response Indicator
RSP	Response
RTI	Response Type Indicator (positive or negative)
RU	Request/Response Unit
S	Secondary
(s)	session services
SC	Session Control
SCS	SNA Character String
SDI	Sense Data Included indicator
SDLC	Synchronous Data Link Control (Level 2)
SEC	Secondary
SESS	Session
SIM	Set Initialization Mode (SDLC)
SLU	Secondary Logical Unit
SNA	Systems Network Architecture
SNAI	SNA indicator

SNC	Sense Code
SNF	Sequence Number Field
SNRM	Set Normal Response Mode (SDLC)
SPU	Secondary Physical Unit
SQN	Sequence Number
SSCP	System Services Control Point
SVC	Services
TC	Transmission Control
TERM	Terminate
TEST	Test (SDLC)
TG	Transmission Group
TGN	Transmission Group Number
TGNFI	TG Non-FIFO Indicator
TGSI	Transmission Group Sweep Indicator
TGSNF	TG Sequence Number Field
TH	Transmission Header
TLU	Terminating Logical Unit
TPF	Transmission Priority Field
TS	Transmission Services
UA	Unnumbered Acknowledgment (SDLC)
UI	Unnumbered Information (SDLC)
UP	Unnumbered Poll (SDLC)
URC	User Request Correlation
VRCWI	VR Change Window Indicator
VRCWRI	VR Change Window Reply Indicator
VRPCI	Virtual Route Pacing Count
VR	Virtual Route
VRID	Virtual Route Identifier
VRN	Virtual Route Number
VRPRQ	Virtual Route Pacing Request
VRPRS	Virtual Route Pacing Response
VRSSNF	VR Send Sequence Number Field
VRWI	VR Reset Window Indicator
VSTI	VR Sequence and Type Indicator
XID	Exchange Identification (SDLC)

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